

Mechanism of Internal Assessment

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IV IA

DEPARTMENT OF BIOTECHNOLOGY

Subject : Chemical Reaction Engineering Date/Day : 23-01-2023 Monday
Subject Code : 18BT52 Duration : 1 hour
Semester/Section : 5th Time : 03:00PM-04:00 PM
Staff-In charge : Dr. Alwin & Mr. Ananda H V Max Marks : 30

Answer any two full questions choosing one full question from each Module

Main Qust	Sub Qust	Questions	Marks	BTL	CO
1	a	Differentiate between the elementary and non elementary reactions?	6	L1,L2	CO - 1
		OR			
	b	Explain about the theories of reaction rate and temperature dependency?	6	L1,L2	CO - 1
2	a.	Derive the design equations of homogeneous system for batch reactor?	6	L1,L2	CO - 2
		OR			
	b	Summarize the qualitative design for series and parallel reactors?	6	L1,L2	CO - 2
3	a	Explain the Characteristics of Non Ideal Reactors?	6	L1,L2	CO - 3
		OR			
	b	Write a note on Exit Age Distributions?	6	L1,L2	CO - 3
4	a	Discuss about the enzyme Specifications?	6	L1,L2	CO - 4
		OR			
	b	Explain about the Enzyme Inhibition?	6	L1,L2	CO - 4
5	a	Define Simple Media and Complex Media? Briefly Explain about the medium requirements for the Fermentation Process?	6	L1,L2	CO - 5
		OR			
	b	Discuss about the growth associated, Non growth associated and Mixed Growth Associated product formation kinetics?	6	L1,L2	CO - 5

- CO - 1 Understand the different importance of kinetic and thermodynamic considerations for the choice of feed temperature in reactor systems
CO - 2 Explain the different steps in reaction mechanisms on catalytic surfaces and identify the rate- determining step
CO - 3 Comprehend the fundamentals of Microbial growth kinetics and its stoichiometry
CO - 4 Analyse the kinetic study of enzymes and its regulation
CO - 5 To describe the medium requirements and medium formulation to get optimal biomass.

Accepted/Accepted with Modification/Rejected

[Signature]
Course Coordinator 21/01/2023

[Signature]
Module Coordinator

[Signature]
HOD

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DEPARTMENT OF BIOTECHNOLOGY

FOURTH INTERNAL ASSESSMENT TEST

Subject : Chemical Reaction Engineering Date/Day : 23-01-2023 Monday
Subject Code : 18BT51 Duration : 1hour
Semester/Section : 5th Time : 03:00PM-04:00 PM
Staff-In charge : Dr. Alwin & Mr. Ananda H V Max Marks : 30

Answer any two full questions choosing one full question from each Module

Main Qust	Sub Qust	Questions	Marks	BTL	CO
1	a	Differentiate between the elementary and non elementary reactions?	6	L1,L2	CO - 1
		OR			
	b	Explain about the theories of reaction rate and temperature dependency?	6	L1,L2	CO - 1
2	a.	Derive the design equations of homogeneous system for batch reactor?	6	L1,L2	CO - 2
		OR			
	b	Summarize the qualitative design for series and parallel reactors?	6	L1,L2	CO - 2
3	a	Explain the Characteristics of Non Ideal Reactors?	6	L1,L2	CO - 3
		OR			
	b	Write a note on Exit Age Distributions?	6	L1,L2	CO - 3
4	a	Discuss about the enzyme Specifications?	6	L1,L2	CO - 4
		OR			
	b	Explain about the Enzyme Inhibition?	6	L1,L2	CO - 4
5	a	Define Simple Media and Complex Media? Briefly Explain about the medium requirements for the Fermentation Process?	6	L1,L2	CO - 5
		OR			
	b	Discuss about the growth associated, Non growth associated and Mixed Growth Associated product formation kinetics?	6	L1,L2	CO - 5

- CO - 1 Understand the different importance of kinetic and thermodynamic considerations for the choice of feed temperature in reactor systems
- CO - 2 Explain the different steps in reaction mechanisms on catalytic surfaces and identify the rate- determining step
- CO - 3 Comprehend the fundamentals of Microbial growth kinetics and its stoichiometry
- CO - 4 Analyse the kinetic study of enzymes and its regulation
- CO - 5 To describe the medium requirements and medium formulation to get optimal biomass.

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DEPARTMENT OF BIOTECHNOLOGY

Scheme and Solution
Fourth Internal Assessment Test – JANUARY 2023

Subject :	Chemical Reaction Engineering	Subject Code :	18BT52
Date/Day :	23/01/23 MONDAY	Sem :	5th
Duration :	1Hr	Time :	3:00-4:00
Staff-In charge :	Mr. ANANDA H V	Max Marks :	30

Mat. 1 Quest ion	Sub Questi on	Solution	Marks Allocat ed
1	a	<u>Elementary reaction</u> :- Individual reaction steps which contribute to the overall reaction → single step reaction → simple in nature → order of reaction is integer <u>Non Elementary reaction</u> :- The reaction in which formation of product from the original reactants occur through a series of steps → Multiple step reaction → complex in nature → order - fractional value → order does not agree with stoichiometric co. efficient	03
	b	<u>Theories of reaction rate & Temp. dependency</u> <u>Arrhenious Law</u> :- $K = K_0 e^{-E/RT}$ $\ln K \uparrow$ slope = $-E/R$ $T \times 10^{-3}$ $\ln(K_2/K_1) = \frac{E}{R} \left[\frac{1}{T_1} - \frac{1}{T_2} \right]$ <u>Collision Theory</u> :- $-r_A = \text{Collision rate} \times \text{fraction of effective collision}$ $K = K_0 T^{1/2} e^{-E/RT}$ <u>Transition State Theory</u> :-	02
			02

Signature of Faculty In charge	Signature of Scrutinizer	Signature of HOD
 21/01/23	 Principal Sapthagiri College of Engineering 14/5, Chikkasandra, Hesaraghatta Main Road, Bengaluru - 560 057	 Head of the Department Dept. of Bio-Technology Sapthagiri College of Engineering No. 57/1, Chikkas Hesaraghatta Main Road

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DEPARTMENT OF BIOTECHNOLOGY

Scheme and Solution
Fourth Internal Assessment Test – JANUARY 2023

Subject :	Chemical Reaction Engineering	Subject Code :	18BT52
Date/Day :	23/01/23 MONDAY	Sem :	5th
Duration :	1Hr	Time :	3:00-4:00
Staff-In charge :	Mr. ANANDA H V	Max Marks :	30

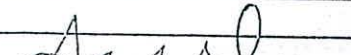
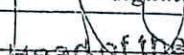
2	a	<u>Design Equations of homogeneous System for Batch reactor</u> Batch reactor → definition Fundamental Equations for Batch reactor Assumptions, derivation design Equations for Batch reactors homogeneous System → Explanation.	02 02 02
	b	<u>Qualitative design for series reactors</u> Series reactors → diagram, Graph Fundamental Equations Design Equations for series reactors <u>parallel reactors</u> parallel reactors definition, Graph diagrams, Fundamental Equations Design Equations for parallel reactors	03 03

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		Dept. of Bio-Technology Sapthagiri College of Engineering No. 57/1 Chikl...



Subject :	Chemical Reaction Engineering	Subject Code :	18BT52
Date/Day :	23/01/23, MONDAY	Sem :	V th
Duration :	1Hr	Time :	3:00 - 4:00
Staff-In charge :	Mr. ANANDA H V	Max Marks :	30

3	<u>Characteristics of non Ideal Reactor</u> → Real reactor → Deviate from Ideal Reactor → Stagnant regions in the vessel (Dead zone formation) → Bypassing or short circuiting of the fluid → Channelling → Recycling of fluid → Due to vortices and turbulence at inlet & outlet	06
3	<u>Exit Age distribution</u> → Residence time distribution (E) → Distribution of time for the stream of fluid leaving the vessel is called as Exit age distribution. → RTD measurement. → Characteristics of chemical reactor → Methods ← Pulse Input ← Step Input ← periodic Input ← Random Input	01 03 02

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Scheme and Solution
Fourth Internal Assessment Test – JANUARY 2023

Subject :	Chemical Reaction Engineering	Subject Code :	18BT52
Date/Day :	27/01/23, MONDAY	Sem :	5th
Duration :	1Hr	Time :	3:00-4:00
Staff-In charge :	Mr. ANANDA H V	Max Marks :	30

4	a	<u>Enzyme Specifications:-</u> Defination → method → Absolute specificity → group specificity → Bond Specificity → Stereochemical Specificity The ability of an Enzyme to select a specific substrate from a range of chemically similar compounds. → character.	01
	b	<u>Enzyme Inhibition:-</u> rate of an Enzyme catalytic reaction is decreases by using Enzyme. Types - Reversible Inhibition - Irreversible Inhibition Competative Inhibition un Competative Inhibition Non Competative Inhibition Mixed Inhibition partial Inhibition Substrate? product? Inhibition → linear Inhibition → parabolic Inhibition → Hyperbolic Inhibition	02

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<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>



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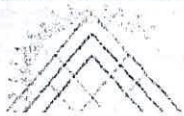
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DEPARTMENT OF BIOTECHNOLOGY

Scheme and Solution
Fourth Internal Assessment Test – JANUARY 2023

Subject :	Chemical Reaction Engineering	Subject Code :	18BT52
Date/Day :	23/01/23, MONDAY	Sem :	5th
Duration :	1Hr	Time :	3:00-4:00
Staff-In charge :	Mr. ANANDA H V	Max Marks :	30

5	A	<u>Simple Media</u> :- Exact composition of nutrients defined source. <u>Complex Media</u> :- Industrial scale, rough capability, undefined source <u>Medium requirements</u> :- Inorganic nutrients, carbon source water, growth factors, precursors, Buffers, chelators, inducers, organic & inorganic nitrogen source. Aeration system.	03
	B	<u>Growth Associated</u> :- → primary metabolite product formation Exponential phase → Graph → formula <u>Non growth Associated</u> :- → secondary metabolite product formation Stationary phase → Graph → formula <u>Mixed growth Associated</u> :- → Graph product formation Exponential/declination phase → formula	02

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F-IAT-04/R0

Internal Assessment Test-III

Subject: Biochemistry

Semester/Section: III

Duration: 60 minutes

Sub Code: 21BT33

Max Marks: 20

Date: 28-02-2023

Note: Answer any two full questions

Q No.	Questions	Marks	BTL	CO's
Module-4				
1 a.	Define photosynthesis. Explain Z- scheme of photosynthesis in detail	05	L3	CO2
b.	What are coupled reactions? Calculate the overall standard free energy change for the coupled reaction of glucose phosphorylation Glucose + Pi $\rightarrow$ Glucose-6-phosphate + H ₂ O ($\Delta G^0 = 13.8 \text{ kJ/mol}$) ATP + H ₂ O $\rightarrow$ ADP + Pi ($\Delta G^0 = -30 \text{ kJ/mol}$) Explain the nature of reaction	05	L4	CO3
OR				
2 a.	Explain electron transport chain and oxidative phosphorylation	05	L3	CO2
b.	Write a note on i) Malate aspartate shuttle	05	L3	CO3
Module- 5				
3 a.	Discuss lactose intolerance in detail	05	L3	CO2
b.	Write a note on Tay Sachs disease	05	L3	CO3
OR				
4 a.	Discuss PKU under i) enzyme defect ii) manifestation iii) symptoms iv) diagnostic tests	05	L3	CO2
b.	Explain about the clinical disorder of gout, its causes and modes of treatment	05	L3	CO3

CO3: Assess the concepts of thermodynamics to study the high energy compounds, their properties, Photosynthesis, ETC and analyze them

CO4: Establish the Biochemistry pathophysiology associated with various disorders of metabolism, hormonal disturbance and analyze them

Signature of Staff incharge

Signature of scrutinizer

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Signature of HOD
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**SCHEME & SOLUTION
INTERNAL ASSESSMENT TEST**

Subject & Subject Code: Biochemistry-21BT33
Date/Day: 28-02-2023

IA First / Second / Third / FOURTH
Staff-In charge: Dr. Veena S. More

Question Number	Solution	Marks Allocated
I. a)	PQ_4 : Plastocyanone - 1st one PQB : Plastocyanone - 2nd one A_0 : e^- acceptor chlorophyll A_1 : Phyloquinone. - Explanation.	5
b:	Endergonic reaction is coupled to an exergonic reaction thro' a common intermediate so that the overall reaction becomes exergonic. $Glucose + P_i \rightarrow Glucose-6-P + H_2O \quad \Delta G'^0 = 13.8 \text{ KJ/mole}$ $ATP + H_2O \rightarrow ADP + P_i \quad \Delta G'^0 = -30.5 \text{ KJ/mole}$ $ATP + Glucose \rightarrow ADP + Glucose-6-P \quad \Delta G'^0 = -16.7 \text{ KJ/mole}$ Overall R_x becomes exergonic $\rightarrow$ spontaneous. Electron Transport chain & oxidative phosphorylation 4 complexes + 1 complex 1. Complex I $\rightarrow$ NADH dehydrogenase 2. Complex II $\rightarrow$ Succinate dehydrogenase	3

ie Staff In charge

Signature of Scrutinizer

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Sapthagiri College of Engineering
No. 57/1, Chikkasandra

Subject & Subject Code : Biochemistry-21BT33

Date/Day : 28-02-2023

IA

Staff-In charge

First / Second / Third

: Dr. Veena S. More

Question Number	Solution	Marks Allocated
	3> Complex III → Ubiquinone Cytochrome C oxidoreductase 4> Complex IV → Cytochrome Oxidase } Explanation ATP synthase → proton gradient across the membrane 5> ATP Synthase → F₀F₁ unit → Rotational catalysis b> Malate - Aspartate shuttle → for transporting reducing equivalents from cytosolic NADH into the mitochondrial matrix	5x1 5

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**SCHEME & SOLUTION
INTERNAL ASSESSMENT TEST**

Subject & Subject Code : Biochemistry - 21BT33
Date/Day : 28-02-23

IA First / Second / Third
Staff-In charge : Dr. Veena S. More

Question Number	Solution	Marks Allocated
	• Prenatal Screening • Carrier Screening Treatment : No cure for the disease Symptomatic treatment given	1
4. a)	Phenylketonuria : Defective enzyme : Phenylalanine hydroxylase (autosomal recessive gene) Phenylalanine $\xrightarrow{\text{Phenylalanine hydroxylase}}$ Tyrosine ↓ Phenylpyruvate Phenylacetate Phenylactate Phenylacetylglutamine Accumulation of Ketacids Treatment : Selecting foods with low levels of Phe.	1
b)	Gout → overproduction of uric acid • Primary Gout → inborn error metabolism Defective enzyme : PRPP synthetase, PRPP-glucosyl aminotransferase, HGPRT, Glu-6-phosphatase • Secondary Gout : Disease causing ↑ synthesis or ↓ excretion of uric acid (Explanation)	3

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DEPARTMENT OF BIOTECHNOLOGY

SECOND INTERNAL ASSESSMENT TEST- AUG 2023

Subject : Biology For Engineers

Date/Day : 5/08/2023

Subject Code : 21BE45

Duration : 1hour

Semester/Section : IV

Time : 9.00AM to 10.00 AM

Staff-In charge : Dr Soumya C

Max Marks : 20

Answer any two full questions choosing one full question from each Module

Main Question	Sub Question	Questions	Marks	BTL	CO
Module -2					
1	a	Explain the engineering application of EEG and its role in capturing different types of brain activity	5	L3	CO2
	b	Explain how a signal transmission occurs from brain to peripheral nerves	5	L3	CO2
OR					
2	a	How can you compare and analyze the architecture of camera and eye. Focus on structural characterization of rods and cones	5	L4	CO2
	b	Elaborate on Concepts of bionic eye, including material used in its construction and Describe the working Principle.	5	L4	CO2
Module – 4					
3	a	Define Echolocation? Explain the Principles of Echolocation and Compare biological echolocation with technical echolocation	5	L3	CO3
	b	Explain the working Principle of Ultrasonography? Add a note on its uses	5	L3	CO3
OR					
4	a	Define Photosynthesis? Explain the Process of Photosynthesis in Plants	5	L3	CO3
	b	Explain New technology photovoltaic cell lies in conversion light energy in to electrical energy.	5	L3	CO3

CO2: Evaluate the principles of design and development, for exploring novel bioengineering project

C03: Collaborate the concepts of biomimetics for specific requirements

Accepted/Accepted with Modification/Rejected

Course Coordinator

Module Coordinator

HOD

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SCHEME & SOLUTION

INTERNAL ASSESSMENT

Subject & Subject Code: *Biology fe bngg* IA

FIRST/SECOND/THIRD

Date/Day : *5/8/23,*

Staff-In-Charge: *Dr. Sounya. C*

Question Number	Solution	Marks Allocated
1	[a] EEG → Diagnosis of epilepsy → Sleep studies → BCI → Research on Brain function → Brain activity. Type - Delta waves - Theta wave - Alpha wave - Beta wave - gamma wave 2 1/2 frequency Activity [b] Signal transmission → K⁺ channel → Neurotransmitter → Na⁺ channel → Receptor → Na⁺K⁺ channel → neuron structure & its function [OR]	5
2	[a] Eye as a camera → Main components → cornea → Iris → pupil, Retina, optic nerve camera → cornea → Diaphragm → Aperture → lens, Black pin compare with design [b] Bionic eye: → concept - devices component - camera, processor, display → Material used - Silicon, titanium alloy, conductive material → polymer - Silicon & polyimides → Optical material, working of Bionic eye • Capture • convert to electrical signal • process signals	5

Signature of the Staff In Charge

Signature Of Supervisor

Signature Of HOD

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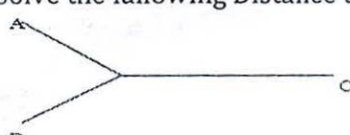
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DEPARTMENT OF BIOTECHNOLOGY
FIRST INTERNAL ASSESSMENT TEST - APRIL

Subject	:	BIOINFORMATICS	Subject Code	:	18BT63
Date/Day	:	26-April-2023, Wednesday	Sem	:	6
Duration	:	1Hr	Time	:	09.00 AM-10.00 AM
Staff-In charge	:	Prof. Ramya D L	Max Marks	:	30

Answer any two full questions choosing one from each Module
(Each full question carries 15 marks)

Main Question	Sub Question	Full Question	Marks	Bloom's Taxonomy Level	Course Outcomes Mapped															
Module -1																				
1	a	Give a brief account on Primary databases with example for each type.	10	L2	CO1															
	b	Appraise PDB as a Structural database.	05	L3	CO1															
OR																				
2	a	Infer on PAM & BLOSUM as Substitution matrices.	10	L3	CO1															
	b	Point out BLAST-Variants.	05	L2	CO1															
Module -1 & 2																				
3	a	Interpret about Protein Threading for structure prediction & add a note on software programs available for the purpose.	08	L3	CO1															
	b	Solve the fallowing Distance table by FM method:  <table data-bbox="794 1386 1035 1520"><tr><td></td><td>A</td><td>B</td><td>C</td></tr><tr><td>A</td><td>-</td><td>22</td><td>39</td></tr><tr><td>B</td><td>-</td><td>-</td><td>41</td></tr><tr><td>C</td><td>-</td><td>-</td><td>-</td></tr></table>		A	B	C	A	-	22	39	B	-	-	41	C	-	-	-	07	L2
	A	B	C																	
A	-	22	39																	
B	-	-	41																	
C	-	-	-																	
OR																				
4	a	Prioritize on PROSITE PATTERN.	08	L3	CO1															
	b	Write a note on Boot-Strap evaluation.	07	L2	CO2															

CO -1 Understand and apply different databases, resource and software tools for sequence alignment.

CO -2 Apply and analyze the phylogenetic analysis and different tools for genomics analysis.

Accepted/Accepted with Modification/Rejected

Course Coordinator

Module Coordinator

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**SCHEME & SOLUTION
INTERNAL ASSESSMENT TEST**

Subject & Subject Code : Bioinformatics IBT63
Date/Day : 26-Apr-2023 / Wednesday

Staff-In charge : P. Ramya D

First / Second / Third / FOURTH

Question Number	Solution	Marks Allocated
1)a)	<u>10 nucleotide DB (any one example)</u> → Introductory to Database regarding organization → 01 maintain the Database → Tools / Software packages available (any 2) → 02 → Sub database / Resource available (any 2) → 02 <u>10 protein DB (any one example)</u> → Introductory to database maintaining organization → 01 → Tools / Software packages available (any 2) → 02 → Resource / Subdatabase available (any 2) → 02	01 02 02 01 02 02
1)b)	<u>PDB</u> → Introductory to PDB as an organization → 01 → Alphabetic PDB ID e.g. A1P3 → 01 → explanation about data submission to PDB by ADIT & MAXIT Tool. → 02 → PDB entries are determined by x-ray crystallography (or) NMR Spectroscopic Method. → 01	01 01 02 01
		05

Signature of the Staff In charge

Signature of Scrutinizer

Signature of HOD

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Dept. of Bio - Page No. 1/2
Sapthagiri College of Engineering
No. 57/1, Chilkasandra
Hesaraghatta Main Road
Bengaluru - 57



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F-IAT-04/R

Department of Civil Engineering
Internal Assessment –I

Subject: Engineering Mechanics	Sub Code: 22CIV13	Name of the course instructor
Semester/Section: 1 st sem, Civil	Max Marks: 20	Prof Kavya H P
Duration: 1 hour	Date: 30/01/2023	Time: 3:00 to 4:00 PM

Note: Answer any two full questions, choosing one from each module

Question No.	Questions	Marks	BLT	CO's
<u>Module-1</u>				
1 a.	Briefly explain the principles of mechanics.	5	L1	CO1
b.	Find the moment at A and B in the figure (a).	5	L3	CO1
OR				
2 a.	State and prove Law of parallelogram of forces.	5	L1	CO1
b.	Find the magnitude and direction of the resultant of the coplanar force system shown in the figure (b).	5	L3	CO1
<u>Module-1 and Module 2</u>				
3 a.	State and prove varignon's theorem.	5	L2	CO1
b.	Find the x and y intercept of the resultant of the system of coplanar forces acting on a lamina as shown in the figure (c). Each square has a side of 10mm.	5	L3	CO1
OR				
4 a.	A system of connected flexible cable shown in figure (d) is supporting two vertical forces 200N and 250N at points B and D. Determine the forces in various segments of the cable.	5	L3	CO2
b.	Find the reactions at the contact point on the roller as shown in the figure (d)	5	L3	CO2

CO1: Compute the resultant of a force system and resolution of a force.

CO2: Comprehend the action equilibrium forces and moments.

Signature of course instructor

Kavya H P
16/01/23
HOD

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Bengaluru - 560 057

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SCHEME and SOLUTION

Subject: <i>Engineering Mechanics</i>	Semester/Section: <i>III / CV</i>	Name of the Course Instructors: <i>Kavya H.P</i>	Date: <i>20/01/23</i>
Sub Code: <i>22CE13</i>	Max.Marks: <i>20</i>		

Q.No	Questions	Marks
1. a)	Principles of mechanics - 1) Transmissibility 2) Superposition	3
b)	Resolution - - - - - $M_A = -200 \cos 30^\circ \times 2 + 200 \sin 30^\circ \times 2 + 100 \times 4 + 100 + 500 \times 2$ $= 1353.59 \text{ (N-m)}$ $M_B = -200 \sin 30^\circ \times 4 + 500 \times 2 - 100 \times 2 + 100 - 200 \sin 30^\circ \times 6 - 200 \cos 30^\circ \times 2$ $= 446.41 \text{ N-m (CW)}$	1 2 2
2 a)	Statement - Law of parallelogram - Proof and diagram $R = \sqrt{F_1^2 + F_2^2 + 2F_1F_2 \cos \theta}$	2 3
3)	$\sum F_x = 252 \cos 15^\circ + 556 \sin 66^\circ - 453 \cos 66^\circ - 375 \cos 30^\circ + 300 \cos 45^\circ$ $= 171.459 \text{ N}$	2

Department of Civil Engineering
Internal Assessment –II

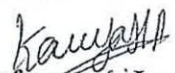
Subject: Engineering Mechanics	Sub Code: 22CIV13	Name of the course instructor
Semester/Section: 1 st sem, Civil	Max Marks: 20	Prof Kavya H P
Duration: 1 hour	Date: 23/02/2023	Time : 2.30 pm -3.30 pm

Note: Answer any two full questions, choosing one from each module

Question No.	Questions	Marks	BLT	CO's
Module-2				
1 a.	List and explain the types of loads.	6	L1	CO2
b.	A simply support beam of length 5m is loaded as shown in the figure (a). Find the reactions at A and B.	4	L3	CO2
OR				
2 a.	List and explain the types of supports.	5	L1	CO2
b.	Find the support reactions of the beam loaded in the figure (b).	5	L3	CO2
Module-3				
3	Find the support reactions and member forces for jointed plane truss shown in figure (c)	10	L3	CO3
OR				
4 a.	State and explain the laws of friction	3	L1	CO3
b.	Find the force P just required to slide the block B in the arrangements shown in figure (d). Find the tension in a string take weight of block A= 500 N , block B = 1000N	7	L3	CO3

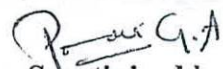
CO2: Comprehend the action of types of loads in rigid bodies and reactive forces

CO3: Analyze the frictional resistance offered by different planes.


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Subject: <i>Engineering Mechanics</i>	Semester/Section:	Name of the Course Instructor:	Date: <i>16/2/23</i>
Sub Code: <i>22CEV13</i>	Max.Marks: <i>20</i>	<i>RAVYA H.P</i>	

Q.No	Questions	Marks
1a)	List of loads. — — — — —	1
	Its types with figures — — — — —	5
b)	FBD - Free body diagram — — — — —	1
	$\sum F_y = R_A - 6 - 2 - 5 + R_B = 0$ $R_A + R_B = 13$ $\sum M_A = 0, R_B = 7.6 \text{ kN}$ $R_A = 5.4 \text{ kN}$	3
2a)	Types of Supports + its figures — — — — —	1+5
b)	$R_{Ex} = 4.33 \text{ kN} \quad R_{Ey} = 12.889 \text{ kN}$ $R_B + R_{Ey} = 18.5 \text{ kN} \quad R_B = 15.611 \text{ kN}$ $R_E = 5.205 \text{ kN}$ $\theta = \tan^{-1} \frac{3.3}{7.1}$	5
3a)	FBD for all supports — — — — —	1
	$R_B = 160 \text{ kN}$ $A_x = -120 \text{ kN}$ $A_y = -60 \text{ kN}$	2

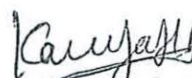
Department of Civil Engineering
Internal Assessment –III

Subject: Engineering Mechanics	Sub Code: 22CIV13	Name of the course instructor
Semester/Section: 1 st sem, Civil	Max Marks: 20	Prof Kavya H P
Duration: 1 hour	Date: 20/03/2023	Time: 12:00PM to 1:00PM

Note: Answer any two full questions, choosing one from each module

Question No.	Questions	Marks	BLT	CO's
<u>Module-4</u>				
1 a.	Build an expression for the centroid of a triangle applying principle of moments	4	L3	CO4
b.	Identify the centroid of figure (a)	6	L3	CO4
OR				
2	Identify the centre of the shaded area shown in figure (b)	10	L3	CO4
<u>Module-4</u>				
3 a.	Build an expression for the moment of inertia for a rectangle applying principle of moments	7	L3	CO4
b.	Define radius of gyration. Derive the expression for the same	3	L1	CO4
OR				
4	Find the least radius of gyration about the x axis and y axis of the shaded area shown in figure (c) .	10	L3	CO4

O4: Locate the centroid and compute the moment of inertia of regular and build up sections.


Signature of course Instructor

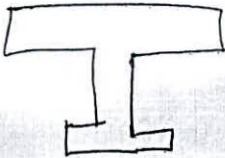
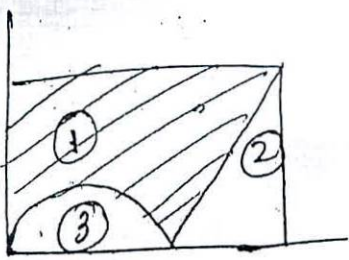

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SCHEME and SOLUTION

Subject: <i>Engineering Mechanics</i>	Semester/Section:	Name of the Course Instructors	Date: <i>13/3/23</i>
Sub Code: <i>22 CIV13</i>	Max.Marks: <i>20</i>	<i>KAVYA.H.P</i>	

Q.No	Questions	Marks
1.a)	Centroid of triangle figure and expressions - - - - -	2
	$\bar{y} = \frac{d}{3}, \bar{x} = \frac{b}{2}$ - - - - -	2
b)	 $\Sigma a = 1800 \text{ mm}^2$ $\Sigma ax = 7200$ $\Sigma ay = 80000$	3
	$\bar{x} = \frac{\Sigma ax}{\Sigma a} = 40 \text{ mm}$ $\bar{y} = \frac{\Sigma ay}{\Sigma a} = 44.44 \text{ mm}$	3
2.	$\Sigma a = 748672.6$ $\Sigma ax = 406135040$ $\Sigma ay = 490668660.6$ 	5
	$\bar{x} = \frac{\Sigma ax}{\Sigma a} = 542.4 \text{ mm}$ $\bar{y} = \frac{\Sigma ay}{\Sigma a} = 655.38 \text{ mm}$	5

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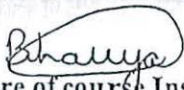
Department of Civil Engineering

Internal Assessment Test –I

Subject: Fluid mechanics & Hydraulics	Sub Code: 21CV42	Name of the Course instructor
Semester/Section: 4 th SEM	Max Marks: 20	Prof. Bhavya CH
Duration: 60 Minutes	Date: 03.07.2023	Time: 3.00 PM to 4.00 PM

Q. No	Answer any two full Questions choosing one from each module	Marks	BLT	CO's
Module 1				
1 a	Define: a) Mass Density b) Specific weight c) Specific volume d) Specific Gravity	5	L ₁	CO ₁
B	Calculate the specific weight, density and specific gravity of one litre of crude oil which weighs 9.6 N.	5	L ₃	CO ₁
OR				
2 a	Explain the various types of Fluids.	5	L ₁ , L ₂	CO ₁
b	The space between two square flat parallel plates is filled with oil. Each side of the plate 60 cm, the thickness of the oil film is 12.5 mm, the upper plate which moves at 2.5 meter per second requires a force of 98.1 N to maintain the speed. Determine 1) The dynamic viscosity of the oil in poise 2) The kinematic viscosity of the oil, if specific gravity is 0.95.	5	L ₃	CO ₁
Module 1				
3 a	Define Capillarity. Derive the Expression for Capillary Rise & Capillary fall.	5	L ₁ , L ₂	CO ₁
b	Calculate the capillary effect in a glass tube of 4 mm diameter, when immersed in 1) water 2) Mercury. The temperature of the liquid is 20° c and the values of the surface tension of water and mercury at 20° c in contact with air are 0.073575 N/m and 0.51 N/m respectively. The angle of contact for water is zero that for mercury 130°. Take density of water at 20° c as equal to 998 kg/m ³ .	5	L ₃	CO ₁
OR				
4 a	Explain the Phenomenon of Surface tension. Derive an expression for surface tension on liquid droplet.	5	L ₁ , L ₂	CO ₁
b	Find the surface tension in a soap bubble of 40 mm diameter when the inside pressure is 2.5 N/mm ² .	5	L ₃	CO ₁

CO1: Student should be able to understand the fluids and their properties.


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SCHEME & SOLUTION
INTERNAL ASSESSMENT

Subject: Fluid Mechanics & Hydraulics
Subject Code: 28CV142
Date: 3/7/23

IA: First / Second / Third
Staff-In charge: BHAVYA CH

Question Number	Solution	Marks Allocated
1) a	Mass density = $\rho = \text{Mass of fluid} / \text{Volume}$ -1- Specific Weight = $\omega = \rho g$ -1- Specific Volume = $1/\rho$ -1- Specific Gravity = $\frac{\text{Weight density of liquid}}{\text{Weight density of } H_2O}$ -2-	-5-
b	$W = 9.6 \text{ N}$ $V = 1 \text{ litre} = \frac{1}{1000} \text{ m}^3$ -1- Sp wt = 9600 N/m^3 -1- Sp density = 978.59 kg/m^3 -1- Sp Gravity = 0.978 -2-	-5-
2) a	Types of fluids Ideal fluid -1- Real fluid -1- Newtonian fluid & Non newtonian fluid -3-	-5-
b	$A = 0.60 \text{ m} \times 0.60 = 0.36 \text{ m}^2$ $Z = \frac{98.1}{0.36}$ 1) $Z = \mu \frac{du}{dy}$ $\mu = 1.365 \frac{\text{Ns}}{\text{m}^2} = 13.65 \text{ Pa.s}$ -2½- 2) $V = 14.35 \text{ Stokes}$ -2½-	-5-

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SAPTHAGIRI COLLEGE OF ENGINEERING
Department of Civil Engineering

SCHEME and SOLUTION

Subject: Fluid Mechanics & Hydraulics	Semester/Section: IV	Name of the Course Instructors	Date: 3/8/2023
Sub Code: 21CV42	Max.Marks : 20	Bhavya CH	

Q.No	Questions	Marks
1) a	Statement $\frac{P}{\rho g} + \frac{V_1^2}{2g} + Z_1$ -1- $\frac{\partial P}{\rho} + g dz + V dV = 0$ -2- Assumptions: -5m 1) Flow is ideal -2- 2) Flow is steady 3) Flow is Incompressible	
b)	$V_1 = 1.114 \text{ m/s}$ -2- $V_2 = 4.456 \text{ m/s}$ -2- $P_2 = 40.27 \text{ N/cm}^2$ -1-	-5m-
2) a	Types of fluid flow Steady & Unsteady flow Uniform & Non uniform flow Laminar & turbulent One, two & three dimensional flow Compressible & Incompressible flow Rotational & Irrotational flow -5-	-5-

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Internal Assessment Test -III

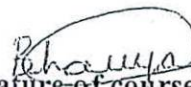
Subject: Fluid Mechanics & Hydraulics	Sub Code: 21CV42	Name of the Course instructor
Semester/Section: 4 th SEM	Max Marks: 20	Prof. Bhavya C H
Duration: 60 Minutes	Date: 07.09.2023	Time: 2.30 PM to 3.30 PM

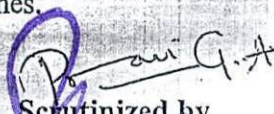
Q. No	Answer any two full Questions choosing one from each module	Mark s	BLT	CO's
<u>Module 3</u>				
1 a	Derive the expression of discharge over a triangular notch or weir.	5	L ₁ , L ₂	CO ₃
b	Water flows over a rectangular weir 1m wide at a depth of 150mm and afterwards passes through a triangular right angled weir. Taking C _d for the rectangular and triangular weir as 0.62 and 0.59 respectively, find the depth over the triangular weir.	5	L ₃	CO ₃
<u>OR</u>				
2 a	Define Water hammering in pipes. Derive an expression of pressure due to gradual closure of valve.	5	L ₁ , L ₂	CO ₃
b	The water is flowing with a velocity of 1.5m/s in a pipe of length 2500m and of diameter 500mm. At the end of a pipe, a valve is provided. Find the rise of pressure if the valve is closed in 25s. Take the value of C=1460m/s.	5	L ₃	CO ₃
<u>Module 4 & 5</u>				
3 a	Explain the Classification of flow in channels.	5	L ₂	CO ₄
b	Derive the expression of most economical channels of rectangular sections.	5	L ₁ , L ₂	CO ₄
<u>OR</u>				
4 a	Define GVF. Derive the equation of gradually varied flow.	5	L ₂	CO ₄
b	Explain with a neat diagram the main parts of a Pelton Wheel.	5	L ₁ , L ₂	CO ₅

CO3: Student should be able to know the concept of notches and its classification.

CO4: Student should be able to understand the most economical channel sections.

CO5: Student should be able to know the working principles of turbines.


Signature of course Instructor


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DEPARTMENT OF CIVIL ENGINEERING

SCHEME & SOLUTION

INTERNAL ASSESSMENT

TEST

Subject: Fluid Mechanics & Hydraulics

Subject Code: 21CV42

Date: 7/9/23

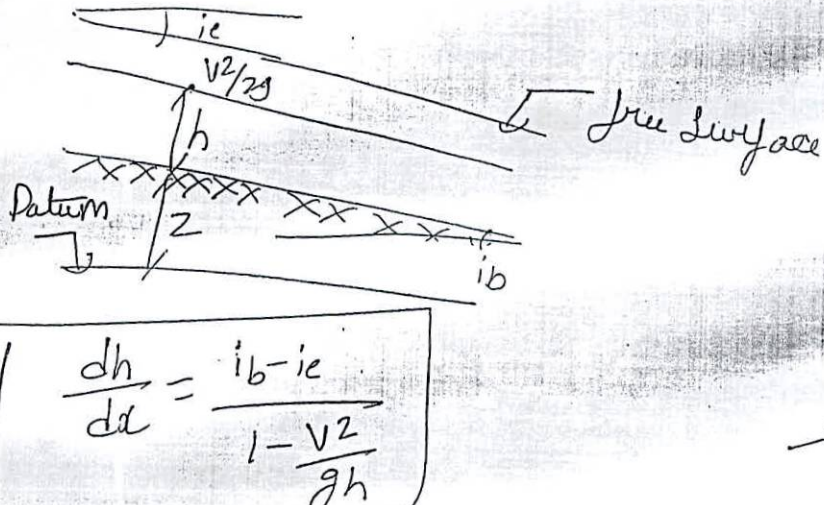
IA: First / Second / Third ✓

Staff-In charge: Bhavya

Question Number	Solution	Marks Allocated
1) a)	$dQ = C_d \times \text{Area of strip} \times \sqrt{2gh}$ $= 2 C_d (H-h) \tan \frac{\theta}{2} \sqrt{2gh} \cdot dh$ $Q = \frac{8}{15} C_d \tan \frac{\theta}{2} \sqrt{2g} H^{5/2}$	-1- -4- 5-
b)	$Q = \frac{2}{3} C_d L \sqrt{2g} H^{3/2}$ $Q = 0.106 \text{ m}^3/\text{s}$ $Q = \frac{8}{15} C_d \tan \frac{\theta}{2} \sqrt{2g} H^{5/2}$ $H = 0.3572 \text{ m}$	-2 1/2- -5-
2) a)	Water hammering: A wave of high pressure	

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Question	Solution	Marks
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Number		Allocated
	 -4- -5-	
b)	<u>Main Parts of a Pelton Wheel</u> It is a tangential flow impulse turbine. The main parts of the Pelton turbine are: 1) Nozzle and flow regulating arrangement. 2) Runner and Buckets 3) Casing 4) Breaking jet -5- -5-	
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SAPTHAGIRI COLLEGE OF ENGINEERING
Department of Civil Engineering
Internal Assessment –I

Subject: Design of Steel Structures	Sub Code: 18CV61	Name of the course instructor
Semester/Section: 6 th	Max Marks: 30	Priyanka A
Duration: 1 hour	Date: 24.04.2023	Time: 9:00 – 10:00 am

Note: Answer any two full questions, choosing one from each module
USE IS 800-2007, ADOPT ANY MISSING DATA IF NECESSARY.

Question No.	Questions	Marks	BLT	CO's
Module-1				
1 a.	What are the advantages and disadvantages of steel structures?	8	L1	CO1
b.	Distinguish between working stress method and limit state method of steel structures.	7	L1	CO1
OR				
2 a.	Write a short note on failure criteria of steel	6	L1	CO1
b.	Mention briefly about load and load combination according to IS code provision	9	L1	CO1
Module-1				
3 a.	Describe briefly about design consideration for steel structures.	7	L1	CO1
b.	Write about load factor and shape factor in plastic theory.	8	L1	CO1
OR				
4 a.	Write about the classification of sections in steel design	9	L1	CO1
b.	Write a short on plastic collapse load.	6	L1	CO1

CO1: Possess knowledge of steel structures, advantages and disadvantages of steel structures, steel code provisions and plastic behavior of structural steel


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SCHEME and SOLUTION

Subject: DSS	Semester/Section: V	Name of the Course Instructors	Date: 24.4.23
Sub Code: 18CV61	Max.Marks : 30	PRIYANKA.A	

Q.No	Questions	Marks
1 a.	Advantages and disadvantages of Steel Structures Advantages → High strength resulting in the reduction of D/L → Speedy construction is possible in the case of Steel Structures where as RC Structures can be constructed only stage by stage, giving enough interval of time for setting, curing, hardening etc → Dismantling and reuse of steel str → They are more economical than concrete str for tall buildings Disadvantages: → They are susceptible to corrosion → they loses its strength @ high temp. → Costly → cannot made by desired size or shape as in the case of RC elements. → They required skilled labour → It requires fabrication & members → Susceptibility to buckling, fatigue fracture & brittle fracture.	08
b.	WSM & LSM. WSM → more conventional & age-old approach which is based on allowable stress & elastic behaviour. → it is assumed that the stress & strain varies linear upto yield pt → the stress in a member due to various working load or working load combinations are to be evaluated, which is called as → $FOS = \frac{YS}{WS}$ LSM → method of design represents a definite advancement over the traditional design philosophies → It uses multiply safety factor → the str shall be designed to withstand safely all loads likely to act.	7
2a	Failure Criteria of Steel → Max^m stress theory, where yield occurs when the max principal stress reaches the uniaxial tensile stress → The max^m strain theory, where yield occurs when the max principal tensile strain reaches half of uniaxial	6



SAPTHAGIRI COLLEGE OF ENGINEERING
Department of Civil Engineering
Internal Assessment –II

Subject: Design of Steel Structures	Sub Code: 18CV61	Name of the course instructor
Semester/Section: 6 th	Max Marks: 30	Priyanka A
Duration: 1 hour	Date: 31.05.2023	Time: 9:00 – 10:00 am

Note: Answer any two full questions, choosing one from each module
 USE IS 800-2007 and Steel table, ADOPT ANY MISSING DATA IF NECESSARY.

Question No.	Questions	Marks	BLT	CO's
Module-2				
1 a.	Explain the failure modes of bolted connections	8	L2	CO2
b.	Design a bolted connection for a lap joint of plate thickness 16 mm and 12 mm to carry a factored load of 160 kN. Use M16 and Fe 4.6 grade bolts.	7	L3	CO2
OR				
2 a.	What are the advantages and disadvantages of welded connection?	7	L1	CO2
b.	A tie member of Truss consisting of angle ISA 65 x 65 x 6 mm of Fe 410 grade is welded to 8 mm. Design a weld to transmit a factored load of 150 kN.	8	L3	CO2
Module-3				
3 a.	Explain the failure modes of axially loaded column.	7	L2	CO3
b.	Determine the compressive strength of ISHB300@576.8 N/m, Length of column is 3m both ends are pinned.	8	L3	CO3
OR				
4 a.	Determine the compressive strength of double angle strut 2ISA 90x60x8 mm connected to gusset plate of 10mm thick when (i) Two angles on same side [Shorter legs Back to Back] (ii) Two angles back to back of a either side of gusset plate [Longer leg back to back]. Take length of member as 2.5m.	10	L3	CO3
b.	What are the types of compression members?	5	L1	CO3

Co2 : Understand the Concept of Bolted and Welded connections.

Co3: Understand the Concept of Design of compression members, built-up columns and columns splices.

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Subject: DSS	Semester/Section: VI	Name of the Course Instructors	Date: 31.5.23
Sub Code: 18CV61	Max.Marks : 30	PRIYANKA A	

Q.No	Questions	Marks
1 a.	Failure modes of Bolted connections → Shear failure of bolt or tearing failure of plate — (2) → Bearing failure of bolt or plate — (2) → Tension failure of bolt or plate — (2) → Block failure of plate — (2) Explain with sketch	08
b.	Given: $t = 16\text{mm}$ & 12mm $P = 160\text{kN}$ $d = 16\text{mm}$, $d_o = 18\text{mm}$ $f_u = 416\text{ bolts}$ $\frac{N}{\text{mm}^2}$ $\gamma_{mb} = 1.25$ $A_{nb} = 0.78 A_{sb}$ $= 0.78 \frac{\pi d^2}{4} = 156.82\text{mm}^2$ Step 1 = $n_s = 0$, $n_n = 1$ $V_{dsb} = 28972\text{N} \frac{N}{\text{mm}^2} = 28.97\text{N}$ No. of bolts required = $\frac{160}{28.97} = 5.5 \approx 6$ Strength of joint / Pitch Length = $28.97 \times 1 = 28.97 \times 10^3\text{N}$ 2 : $T_{dn} = 3542.4 (P-15) \text{ in N}$ $P = 30\text{mm}$, min^m pitch = 40mm Step 3 : $e = 27\text{mm}$ $V_{dpb} = ?$ $k_b = 0.49$ $V_{dpb} = 77.14\text{kN}$	7

Q.No	Questions	Marks
	$b/b_f = \frac{300}{250} = 1.2 \quad t_f = 10.6 \text{ mm}$ Buckling class ZZ - b yy = c $r_y < r_z, r_{\min} = r_{yy} = 54.1 \text{ mm}$ $\lambda_y = 64.69$ $\frac{KL}{r} = 60 = 168 \quad \frac{KL}{r} = 70 - 152 \quad \frac{KL}{r} = 64.69$ $f_{cd} = 160.49 \text{ N/mm}^2$ Design Compressive Strength $P_d = 1201.26 \text{ kN} \checkmark$	
4a	Sketch = ② Steel Table Values. $A = 2672 \text{ mm}^2$ $r_z = 31.4 \text{ mm}$ $r_{\min} = 31.4 \text{ mm}$ ① $\lambda = 81.20 \text{ m}$ $f_{cd} = 134.2 \text{ N/mm}^2$ $l = 2.55 \text{ m}$ $P_d = 358.58 \text{ kN}$ ② $A = 2672 \text{ mm}^2$ $\lambda = 104.53$ $r_{\min} = 28.7 \text{ mm}$ $f_{cd} = 101.38$ $P_d = 270.88 \text{ kN}$	10.
b.	<u>Types</u> Member (Short column). (1) Short Compression (2) Intermediate Comp member (3) Slender or long comp member.	5.

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Course Co-ordinator

A. a. 15/23.

J. 29/05/23
HOD.

Q.No	Questions	Marks
b.	$A_{nc} = 770 \text{ mm}^2$ $A_{go} = 700 \text{ mm}^2$ $\text{Total area} = 1470 \text{ mm}^2$ $A_n = 882 \text{ mm}^2$ 5	

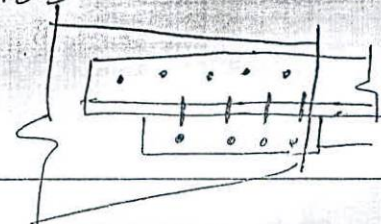
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(Signature)
Course Coordinator

(Signature) 23/04/23
H.O.D.

Subject: DSS	Semester/Section: V₁	Name of the Course Instructors	Date: 26.6.23
Sub Code: 18CV61	Max.Marks: 30	Priyanka-A	

Q.No	Questions	Marks
1a.	Different modes of failures of a tension member ① Failure due to yielding of Gross section - 2 ② Failure due to Net section rupture - 3 ③ Failure due to Block Shear. - 2 Explain according to IS 800-2007	7
b.	$T_{dn} = \frac{\phi A_n f_u}{\gamma_m}$ $A_n = 1524.39 \text{ mm}^2$ $A_g = 1905.48 \text{ mm}^2$ $A_{g \text{ required}} = 1905.48 \text{ mm}^2$ $A_{nb} = 245 \text{ mm}^2$ $A_g = 2274 > 1905 \text{ mm}^2$ $SS = 90.52 \text{ kN}$ $BS = 78.72 \text{ kN}$ $BV = 78.72 \text{ kN}$ $n_0 = 6$ $T_{dg} = 516.81 \text{ kN}$ $T_{dn} = 535.86 \text{ kN} > 400 \text{ kN} - \text{Safe}$	8
a2.	Factors affecting strength of Tension members ① Effect of bolt holes ② Net area of c/s ③ Effect of bearing stresses ④ Effect of Shear lag ⑤ Geometry of the section ⑥ Ductility of the section ⑦ Spacing of fasteners ⑧ Spacing ⑨ Method of fabrication ⑩ Effect of Residual stresses and strains.	7
b.	① $A_g = 1539 \text{ mm}^2$, $T_{dg} = 349.77 \text{ kN}$, $T_{du} = 342.4 \text{ kN}$ $T_{db} = 320.42 \text{ kN}$, $T_{dv} = 264.98 \text{ kN}$ $T_d = 264.98 \text{ kN}$	8
3a.	Lug angles 	

SAPTHAGIRI COLLEGE OF ENGINEERING
Department of Civil Engineering
Internal Assessment Test -I

Subject: Design of Prestressed Concrete Elements	Sub Code: 18CV81	Name of the course instructor
Semester: Section: 8 th SEM	Max Marks: 30	Prof. Pallavi G A
Duration: 60 Minutes	Date: 17.03.2023	Time: 9.00 AM to 10.00 AM

Q. No	Answer any two full Questions choosing one from each module	Marks	BLT	CO's
<u>Module 1</u>				
1 a	List and explain types of Prestressing.	5	L, L ₁	CO
b	A Prestressed concrete beam 200mm wide and 300mm deep is used over an effective span of 6m to support an imposed load of 4kN/m. the density of concrete 24kN/m ³ . At the quarter span section of the beam. Find the magnitude of a) The concentric prestressing force. b) The eccentric prestressing force i.e $e=50\text{mm}$, when bottom fiber stress=0	10	L ₁	CO
<u>OR</u>				
2 a	What are the advantages and disadvantages of PSC?	5	L	CO
b	A PSC beam supports a live load of 3kN/m over a simply supported span of 10m. The beam has an I-section with an overall depth of 400mm. The width of flange is 200mm. thickness of flange is 60mm. The beam is to be prestressed by an effective prestressing force of 250kN. Determine eccentricity required such that the resultant stresses at soffit of the beam at the central span is zero. If the tendon is concentric, what should be the magnitude of prestressing force for the resultant stress to be zero @ bottom fiber of span section.	10	L ₁	CO
<u>Module 1</u>				
3 a	List and explain any two types of post tensioning anchorages.	5	L, L ₁	CO
b	A rectangular concrete beam of cross section 300mm deep and 200mm wide is prestressed by means of 15 wires of 5 mm diameter located at 65mm from bottom of beam and wires of 5mm dia located at 25mm from the top. The prestressing in the steel is 840 N/mm ² . Find the stresses at extreme fibres of the midspan of beam section. The beam supports a live load of 6kN/m in addition to self-weight over a span of 6m.	10	L ₁	CO
<u>OR</u>				
4 a	Differentiate pretensioned concrete and post tensioned concrete beam.	3	L ₁	CO
b	An unsymmetrical I section beam is used to support an imposed load of 2kN/m over a span of 8m. The sectional details are, top flange 300mm wide, 60mm thick; bottom flange 100mm wide and 60mm thick; thickness of the web 80mm; over all depth of the beam 400mm. At the central span the effective prestressing force of 100kN is located at 50mm from the soffit of the beam. Estimate the stresses at central section of the following load condition. a) Prestress+self-weight (at transfer) b) Prestress+ self-weight +live load (at working)	12	L ₁	CO

CO1: Student should be able to understand the requirement of PSC members for present scenario.

Signature of course Instructor

Scrutinized by

HOD

17/03/23

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AY: 2022-2023

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DEPARTMENT OF CIVIL ENGINEERING

SCHEME & SOLUTION INTERNAL ASSESSMENT TEST

Subject: Design of Prestressed Concrete
Subject Code: 18CV81
Date: 17/3/2023

IA: First / Second / Third
Staff-In charge: Pallavi G.A

Question Number	Solution	Marks Allocated
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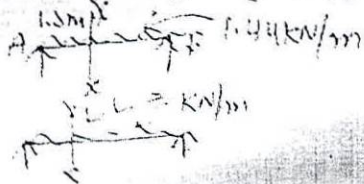
1) a) Pre tensioning } List --- ①
Post tensioning } explanation --- ④

05

b) Area = 60000 mm²

$$Z_t = Z_b = \frac{I}{y} = \frac{bd^3}{12} / \frac{d}{2} = \frac{bd^2}{6}$$

$$Z_t = Z_b = 3 \times 10^6 \text{ mm}^3$$



$$M_g = 4.86 \text{ kN-m}$$

$$M_q = 13.5 \text{ kN-m}$$

$$P = 367.2 \text{ kN} (\because e=0)$$

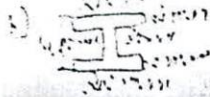
$$P = 183.6 \text{ kN} (e=50 \text{ mm})$$

10

2) a) Advantages of PSC }
Disadvantages }

$$2 \frac{1}{2} \times 2$$

05



$$A = 48400 \text{ mm}^2$$

$$I_{xx} = 847 \times 10^6 \text{ mm}^4$$

$$Z_t = Z_b = 4.85 \times 10^6 \text{ mm}^3$$

$$M_g = 14.5 \text{ kN-m}$$

$$DL = 1.5 \text{ kN/m}$$

$$M_q = 13.5 \text{ kN-m}$$

$$P = 367.2 \text{ kN} (e=0)$$

$$P = 183.6 \text{ kN} (e=50 \text{ mm})$$

10

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SAPTHAGIRI COLLEGE OF ENGINEERING

Department of Civil Engineering

Internal Assessment Test -III

Subject: Design of Prestressed Concrete Elements	Sub Code: 18CV81	Name of the course instructor
Semester/Section: 8th SEM	Max Marks: 30	Prof. Pallavi G A
Duration: 30 Minutes	Date: 02.05.2023	Time: 9.00AM to 10.00AM

Note: Answer any two full questions, choosing one from each module

Question No.	Questions	Marks	BLT	CO's
Module-4				
1 a.	A concrete beam of rectangular section 200mm wide and 600mm deep is prestressed by a parabolic cable located at an eccentricity of 100mm at mid span and zero at the supports. If the beam has a span of 10m and carried a uniformly distributed live load of 4.0kN/m, find the effective force necessary in support section. For this condition, calculate the principle stresses. The density of concrete is 25kN/m ³ .	08	L2	CO4
b.	A support section of a prestressed concrete beam is 100mm and 250mm is required to support an ultimate shear force 60kN. The compressive prestress at the centroid axis is 5kN/mm ² . The characteristic cube strength of concrete is 40kN/mm ² . The cover to the tension reinforcement is 50mm. If $f_y = 250 \text{ N/mm}^2$, Design suitable reinforcement at the section using the IS code.	07	L2	CO4
OR				
2 a.	A prestressed concrete beam of span 10m has rectangular section 120mm wide and 300mm deep is prestressed by a curved cable carrying an effective force of 180KN. The beam supports a total UDL of 5kN/m which includes the self-weight of the member. The beam is additionally prestressed by vertical cables imparting a stress of 2.50N/mm ² in the direction of the depth of the beam. Estimate the nature of principal stresses developed at the support section. The cable has zero eccentricity at supports and an eccentricity of 100mm at mid span section.	08	L2	CO4
b.	The support section of a PSC beam 120mm*300mm is required to support an ultimate shear force of 120KN. The prestress at centroid axis is 5N/mm ² , $f_{ck} = 40 \text{ N/mm}^2$, $f_y = 415 \text{ N/mm}^2$. The cover to tension reinforcement is 50mm. Check the section for shear and design suitable shear reinforcement.	07	L2	CO4
Module-5				
3 a.	A PSC beam 250mm wide and 750mm deep is subjected to a shearing force of 900KN. The fiber stress under working loads is 4N/mm ² . If the effective prestress is 1000N/mm ² and area of cable 1500mm ² , Design the shear reinforcement the cable is inclined at an angle of the arc $\sin^{-1}(1/6)$.	08	L2	CO5
b.	A Freyssinet anchorage 100mm dia carrying 12 wires of 7mm dia is embedded concentrically in the web of an I- section of web	07	L2	CO5

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Subject: <i>Design of Reinforced Concrete Elements</i>	Semester/Section: <i>7th 'A'</i>	Name of the Course Instructors: <i>PALLAVI G.A</i>	Date: <i>10/05/2023</i>
Sub Code: <i>18CV 81</i>	Max.Marks : <i>30</i>		

Q.No	Questions	Marks
1 a)	$*DL = 3 \text{ kN/m}$ $V_u = 52.5 \text{ kN}$ $W_u = 10.5 \text{ kN/m}$ $*T_u = 0$ $P = 1312.5 \text{ kN}$ $f_x = 10.93 \text{ N/mm}^2$ $f_y = 0$ --- (4) $\sigma_{max} = 10.93 \text{ N/mm}^2$ $\sigma_{min} = 0$ --- (5) $V = 52.5 - P(0.04) \dots (3)$ $V_{co} = 0.67 bD \sqrt{f_t^2 + 0.8 f_c P f_t}$	08
b)	$V_u = 60 \text{ kN}$ $f_t = 1.52 \text{ N/mm}^2$ $V_{co} = 48.51 \text{ kN} \dots (2)$ $A_{sv} = 100.53 \text{ mm}^2$ $S_v = 380.6 \text{ mm} \dots (3)$ Diagram --- (2)	07
2 a)	$V_u = 37.5 \text{ kN}$ Net SF $V = 30.3 \text{ kN}$ $a_g = 135 \times 10^6$ --- (3) $I = 270 \times 10^6 \text{ mm}^4$ $T_u = 1.25 \text{ mm}^2$ --- (2) $f_x = 5 \text{ N/mm}^2$ $f_y = 2.5 \text{ N/mm}^2$ --- (1) $\sigma_{max} \text{ \& } \sigma_{min} (5.52 \text{ N/mm}^2 \text{ \& } 1.97 \text{ N/mm}^2) \dots (2)$ Principal stresses = $\frac{f_x + f_y}{2} \pm \frac{1}{2} \sqrt{(f_x - f_y)^2 + 4T_u^2}$	08
b)	$V_{co} = 69.86 \text{ kN}$ $f_t = 1.52 \text{ N/mm}^2$ --- (2) $A_{sv} = 100.53 \text{ mm}^2$ $S_v = 180.9 \text{ mm} \dots (3)$ Diagram --- (2)	07



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Department of Civil Engineering

Internal Assessment Test - II

Subject: Design of Pre Stressed Concrete Structures	Sub Code: 18CV81	Name of the course instructor
Semester/Section: 8th SEM	Max Marks: 30	Pallavi G A
Duration: 60 Minutes	Date: 13.04.2022	Time: 9.00AM-10.00 AM

Note: Answer any two full questions, choosing one from each module

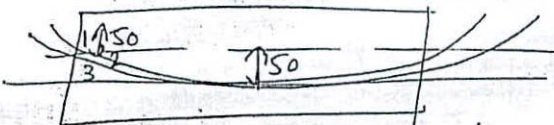
Q No.	Questions	Marks	BLT	
Module 2				
1.a	List and explain the various losses in pre-tensioned and post tensioned beams.	5	L ₁₂	C
b	A post tensioned concrete beam 100mm wide 300 deep spanning over 10m is stressed by successive tensioning and anchoring of 3 cables 1,2 and 3 respectively. The c/s area of each cable is 200mm ² and initial stress in the cable is 1200N/mm ² , $m=6$. The first cable is parabolic with an eccentricity of 50mm below the centroidal axis at the center of the span and 50mm above the centroidal axis about the support section. The second cable is parabolic with zero eccentricity at the support and an eccentricity of 50mm at the center of the span. The 3rd cable is straight having a uniform eccentricity of 50mm below the centroidal axis. Estimate the %age loss of stress in each of the cable if they are successively tensioned and anchored only due to elastic deformation.	10	L ₃	C
OR				
2.a	A post tensioned rectangular beam 300×600 mm in section is prestressed with an initial pre stress of 950 N/mm ² . There are four straight cables of each of area 250 mm ² . The cables are situated at 100 mm from the soffit. Determine the percentage loss of pre stress due to concrete. Assume the following, Shrinkage strain of concrete = 2×10^{-4} , modular ratio = 6, Ultimate creep strain of concrete = 4×10^{-6} . The cables are pulled one by one.	8	L ₃	C
b	A Pre tensioned concrete beam 200×300 mm and span 6m is initially prestressed by a force of 400 kn applied at a constant eccentricity of 70 mm by tendons of area 400 mm ² . If $E_s = 2 \times 10^5$ N/mm ² , $E_c = 0.33 \times 10^5$ N/mm ² , creep coefficient in concrete = 2.0, Shrinkage strain in concrete = 0.0002, Stress relaxation in steel = 3%. Find percentage loss of stress in tendon.	7	L ₃	C
Module 3				
3.a	Define Effective Bond and Unbonded.	2	L ₁	C
b	A pretensioned pre-stressed concrete T beam having a flange width of 1200mm and flange thickness of 150mm, width and depth of web being 300mm and 1500 mm respectively. The area is pre stressed by 4700mm ² of high tensile steel located at an effective depth of 1600mm. If $f_{ck} = 40$ N/mm ² and $f_p = 1600$ N/mm ² . Estimate the ultimate flexural strength of the T section as per IS code recommendations.	13	L ₃	C
OR				
4.a	What are the different types of flexural failure observed in PSC beam.	5	L ₁	C
b	A post tensioned beam with unbonded tendons is of rectangular section 400 mm wide with an effective depth of 800 mm. The cross sectional area of the pre-stressing steel is 2840 mm ² . The effective pre stress in the steel after all losses is 900 mm ² . The effective span of the beam is 16 m. If $f_{ck} = 40$ N/mm ² . Estimate the ultimate moment of resistance of the section using IS 1343 Code recommendations.	10	L ₄	C

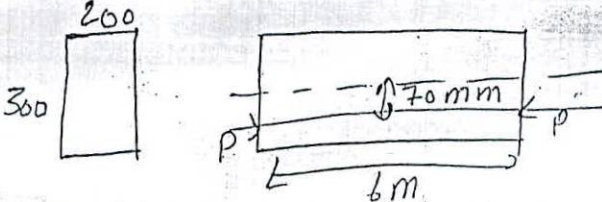
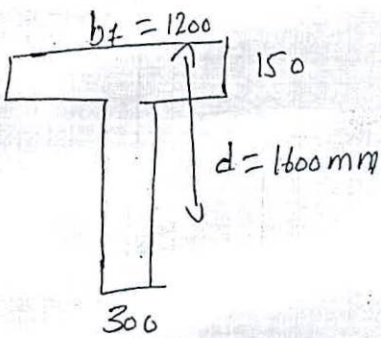
CO2: Students are capable of analyzing the PSC element and finding its efficiency

CO3: Students are able to design PSC beam for different requirements.

SCHEME and SOLUTION

Subject: Design of Prestressed Concrete Structures	Semester/Section: 8 th	Name of the Course Instructors: Pallavi C.A.	Date: 13.4.2022
Sub Code: 18CV81	Max.Marks :		

Q.No	Questions	Marks
1)a	Losses in Prestension 4 losses Elastic deformation, Shrinkage, Creep, Relaxation, Anchorage 6 losses Elastic deformation, Shrinkage, Creep, relaxation, Anchorage, friction	-5M
b	Figure  $P = 240 \text{ kN}$, $I = 225 \times 10^6 \text{ mm}^4$ When Cable 1) is pulled & anchored Loss in Cable ① = 0 When Cable 2) is pulled & anchored Loss in Cable ② = 0 Loss in Cable ①. $f_c = 9.78$ $L = m f_c = 58.68 \text{ N/mm}^2$ When Cable 3) is pulled & anchored Loss in Cable ③ = 0 Loss in Cable ② = 58.68 Loss in Cable ① = 53.34 Final loss in each cable ① = 112.02 N/mm² ② = 58.68 ③ = 0	-1- -2- -1- -2- -2- -2-

Q.No	Questions	Marks
	loss due to shrinkage = 40 loss due to creep = 2.46 N/mm^2 Total loss = 70.10 $\therefore$ loss = 7.3.1.	-1- -8m-
b)	 loss due to E.O = 66.13 N/mm^2 loss due to shrinkage = 40 N/mm^2 loss due to creep = 132.24 N/mm^2 loss due to Relaxation = 30 Total loss = 268.3 N/mm^2 $\therefore$ loss = 26.8.1.	-2- -1- -1- -1- -1- -1- -7m-
3a)	Definition Effective Bond Unbonded	-1- -1- -2-
b)		-2-
a)	Assume N.A lies within flange ($x_u < D_f$) $\frac{A_{st} P}{b_f d f_{ck}} = 0.098$ $\frac{x_u}{d} = 0.213$ $x_u = 340.8 \text{ mm}$	-3-
	Hence assumption is wrong	

USN	1	S	G								
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Academic Year: EVEN/2022- 2023

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
INTERNAL ASSESSMENT TEST – I

F-IAT-04/R0

Subject: INTERNET OF THINGS
Semester/Section: VHI / A & B
Duration: 1 hours

Sub Code: 18CS81
Max Marks: 30
Date: 17 -03-2023

Note: Answer any two full questions, choosing one from each module

Question No.	Questions	Marks	BLT
Module-1			
1 a.	Explain IoT Data Management and Compute Stack	7	L1
b.	Explain the following: a) Explain the Access Network Sublayer with a neat diagram. b) With a neat diagram explain architecture of IoT.	8	L1
OR			
2 a.	Compare IT and OT.	7	L3
b.	Analyze and explain with a neat diagram one M2M IOT standardized architecture and IOT world Forum standardize architecture	8	L4
Module-1			
3 a.	With a neat diagram explain how actuators and sensors interact with physical world. Classify actuators based on energy type	7	L2
b.	Analyze and explain protocol stack utilization IEEE 802.15.4	8	L4
OR			
4 a.	With a neat diagram explain characteristics of Smart Objects.	8	L2
b.	What is SANET? Explain some advantages & disadvantages that a wireless based solution offers.	7	L2

Course Outcomes

Co1- Interpret the impact and challenges posed by IoT networks leading to new architectural models.

Co2- Compare & contrast the deployment of smart objects & the technologies to connect them to network.

Blooms Taxonomy: L1- Remembering, L2: Understand, L3: Apply, L4: Analyzing, L5: Evaluating, L6: Creating

Madhusree
Course Coordinator

[Signature]
Module Coordinator

[Signature]
HOD

Professor & Head of the Department
Computer Science Engineering
Sapthagiri College of Engineering
Bangalore - 57

[Signature]
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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

NBA Accredited

Academic Year: EVEN/2022-2023

INTERNAL ASSESSMENT TEST -I||

SCHEME & SOLUTION

F-IAT-05/R0

Sem. & Sec.: IV A & B

Date: 08/9/23

Subject: Microcontroller & Embedded System

Subject Code: 21CS43

Duration: 60 MIN

Max. Marks: 30

Q. No.	Solutions	Marks Allocated
1	<u>Embedded</u>	
a)	A combination of special purpose hardware embedded as for executing specific application	1
b)	Applications are alterable.	1
c)	Performance is the key deciding factor	1
d)	Less/not at all tailored towards reduced operating power requirements.	1
e)	Need not be deterministic in execution behaviour	1
	<u>General Computing</u>	
a)	A combination of generic hardware & a GPOS for executing a variety of application	1
b)	Firmware is pre programmed.	1
c)	Application specific requirement	1
d)	Highly tailored to take advantage of the power.	1
e)	Execution behaviour is deterministic for certain types of ES	1

1) b) Embedded firmware refers to the control algorithm or the configuration setting that an Embedded system developer. (1)

There are various methods available for developing the Embedded firmware

- 1) Write the program in high level language like Embedded C/C++ (1)
- 2) Write the program in assembly language using the instruction supported

The process of converting the program written in either a high level language specific Assembly Code to machine readable binary code 'HEX file creation'. If the program is written in Embedded C/C++ using an IDE, the compiler included in the IDE converts it into corresponding. Also third party tools are available, which may be of free of cost, for this conversion. (2)

a) Automotive applications make use of serial buses for communication, which greatly reduces the amount of wiring required inside a vehicle.

Controller Area Network (CAN) :- The CAN bus.

was originally proposed by Robert Bosch. It supports medium speed & high speed data transfer.

(1)

Local Interconnect Network :- LIN It is a single master slave communication interface. LIN is a low speed, single wire communication interface.

(2)

-5-

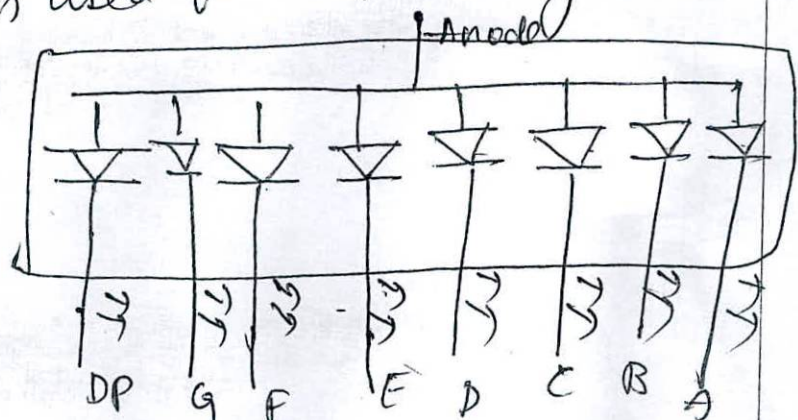
Media-Oriented System Transport (MOST) bus :-

The media-oriented system transport (MOST) is targeted for automotive audio/video equipment interfacing, used primarily in European cars.

(2)

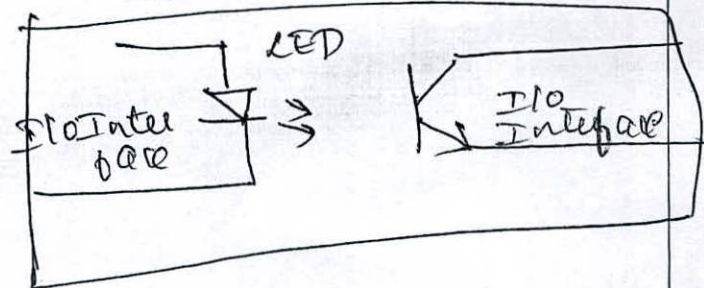
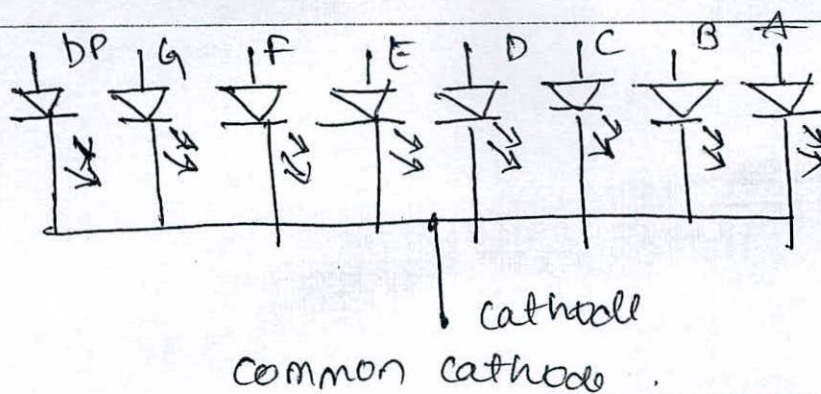
2b) The 7-segment LED display is an output device for displaying alpha numeric characters. It contains 8 light-emitting diodes arranged in special form. Out of 8 LED segments 7 are used for displaying alpha numeric characters & 1 is used for representing decimal point.

A B
E G C
D



Common Anode

Principal



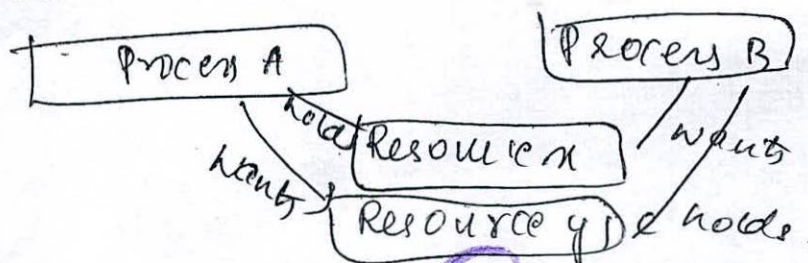
Working of 7-segment LED Display

3a) The process is split into multiple threads, which executes a portion of the process, there will be a main-thread & rest of the thread will be created within the main thread

→ The multithread architecture of a process can be visualized with thread diagram

- Better memory utilization
- Since the process is split into different threads
- Efficient CPU utilization,

3b) Deadlock definition.



conditions favouring deadlock: mutual exclusion, hold & wait, no resource preemption, circular wait
Handling Deadlock.

(2)
(2).

4/a)

Binary Semaphore

Diagram, Explaining the concept of binary semaphore.

- only one process/thread, can own the binary semaphore at a time.
- The state of a binary semaphore.
- The implementation of binary semaphore is OS kernel dependent.

-5-

4/b)

Simulator & Emulator: Simulator is a software tool use for simulating the various conditions for checking the functionality of the application firmware. IDE itself will be providing simulator support.

-5-

→ Emulator is hardware device which emulates the functionalities of the target device & allows real time debugging of the embedded firmware in a hardware environment.

Name and Signature of

1. Course coordinator: Chaitra.P

2. Scrutinizer: MV

K. S. S.
Approved

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B
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Bengaluru - 560 037



INTERNAL ASSESSMENT TEST -III
SCHEME & SOLUTION

F-IAT-05/R0

Sem. & Sec.: VIth B

Date: 03/07/23

Subject: Computer Graphics & Visualization

Subject Code: 18CS62

Duration: 60 MIN

Max. Marks: 30

Q. No.	Solutions	M. Alk
1 a.	$T = \begin{bmatrix} 1 & 0 & 0 & -x_0 \\ 0 & 1 & 0 & -y_0 \\ 0 & 0 & 1 & -z_0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$ $R = \begin{bmatrix} u_x & u_y & u_z & 0 \\ v_x & v_y & v_z & 0 \\ w_x & w_y & w_z & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$ $M_{VC,DC} = R \cdot T$ $\begin{bmatrix} u_x & u_y & u_z & -u \cdot p_0 \\ v_x & v_y & v_z & -v \cdot p_0 \\ w_x & w_y & w_z & -w \cdot p_0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$ Diagram - 3 Explanation - 2 Ans - V - 3	3-8

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b.

\$ difference each carry 1 m

- finite infinite distance
- COP Direction of projection
- change No change in size
- realistic Not realistic
- not used for exact measurement
- not parallel line remain

2
a)

OpenGL program functions - 2
Program - 6

b)

OpenGL polygon-culling function
OpenGL depth Buffer function
OpenGL wireframe surface visibility methods
OpenGL Depth culling function

$2 \times 3 = 6$
 $1 \times 1 = 1$

3
a)

String, locator, pick, choice, valuator
stroke
 $6 \times 1 = 6$
Examp - 1

b)

Define the action
Link the menu
Register callback function
glut create menu
glut Add entry
glut Attach menu

Pairs 3 + 5
Explanation

4
a

1. smooth display
2. interactive devices
3. methods
4. interface
5. Feedback
6. Tolerance
7. visual motor properties

$$7 \times 1 = 7m$$

7

b

property 1 $P(0) = P_0$
 $P(1) = P_n$

$$P'(0) = -nP_0 + nP_1$$

$$P'(1) = -nP_{n-1} + nP_n$$

$$P''(0) = n(n-1)[(P_2 - P_1) - (P_1 - P_0)]$$

$$P''(1) = n(n-1)[(P_{n2} - P_{n-1}) - (P_{n-1} - P_n)]$$

Property 2 $\sum_{k=0}^n B E_{k,n}(u) = 1$

$$8 \times 2 = 4$$

4

8

$$\text{Techniques} = 4$$

Name and Signature of

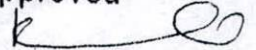
1. Course coordinator:

2. Scrutinizer: 

Assistant Head of the Department
 Computer Science Engineering
 Sapthagiri College of Engineering
 Bangalore - 57


 Principal
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Approved



HOD, CSE

Assistant Head of the Department
 Computer Science Engineering
 Sapthagiri College of Engineering
 Bangalore - 57



INTERNAL ASSESSMENT TEST - I
SCHEME & SOLUTION

F-IAT-05/R0

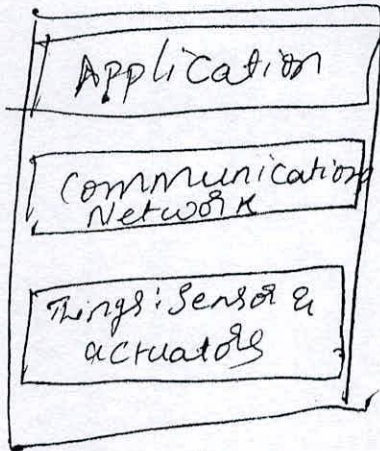
Sem. & Sec.: 8th A & B
 Subject: IOT
 Duration: 60 MIN

Date: 17/3/2023
 Subject Code: 18CS
 Max. Marks: 30 Marks

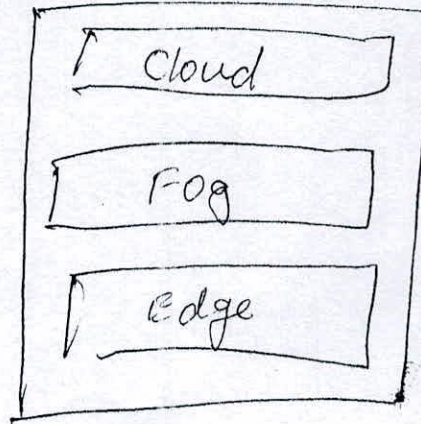
Q. No.	Solutions	Mark Allocation
1a	Handwritten notes for 1a: - Smart objects: Millions Embedded S/S & Sensors, Low Power, Low Bandwidth - Fog layer: Millisecond / Sub-second Response - Core IPv6 Network: Transaction response Time - Data center/cloud: Hundreds Data center/cloud Explanation of each layer: - Smart objects: 10 cm - Fog layer: Ranges not strictly Defined (WPAN, WHAN, WMAN, WWAN) - Core IPv6 Network: cellular (licensed), WWAN, LPWAN (licensed) - Data center/cloud: < 100 km, LPWAN (unlicensed)	3 Marks
1b	Handwritten notes for 1b: - Smart objects: Millions Embedded S/S & Sensors, Low Power, Low Bandwidth - Fog layer: Millisecond / Sub-second Response - Core IPv6 Network: Transaction response Time - Data center/cloud: Hundreds Data center/cloud	4 Marks

16 ii)

Core IoT
Functional Stack



IoT Data Management
& Compute Stack



Security

Explanation of the architecture

8 marks

2a)

Criteria

Operational focus

Priorities

Types of data

Security

Implication of failure

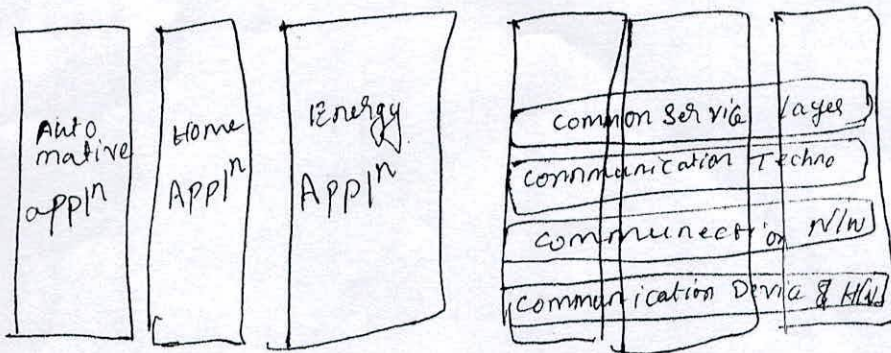
Network upgrades (S/W or h/w)

Security Vulnerability

Explanation each criterion for both IT & OT

147

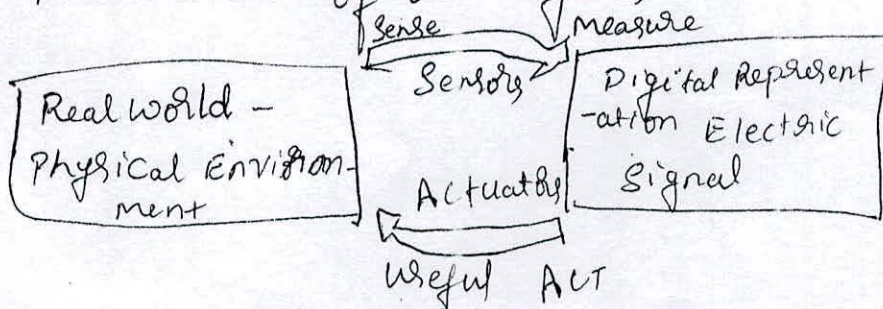
2b)



8 marks

Explanation of all layers

3a)



Different types of Actuators

- 1) Mechanical
- 2) Electrical
- 3) Electromechanical
- 4) Electromagnetic
- 5) Hydraulic & Pneumatic
- 6) Smart Material
- 7) Micro & nano

3b) Protocol

ZigBee
6LOWPAN
ZigBee IP
ISA 100.11a
WirelessHART
Thread

4a) Smart object Characteristics explanation

- i) Processing unit
- ii) Sensors & actuators
- iii) Communication devices
- iv) Power source

4b) A sensor/actuator network (SANET), as the name suggests, is a network of sensors that sense and measure their environment and/or actuators that act on their environment

Advantages

- 1) Greater deployment flexibility

2) large number of nodes

SAPTHAGIRI COLLEGE OF ENGINEERING
Department of Electronics & Communication Engg.
Internal Assessment Test –III

Subject: **Digital System Design using verilog**
Semester/Section: **3 / A & B**
Duration: **1hour**

Sub Code: **21EC32**
Max Marks: **20**
Date: **28.02.2023**

Question No.	Questions	Marks	BLT	CO's
<u>Module 3</u>				
1.	Explain the working of MS-JK flip flop or MS-SR flip flop with logic symbol and timing diagram.	10	L2	CO3
(OR)				
2a.	What is Characteristic Equations? Derive the characteristic equations of SR and T flip-flops.	05	L2	CO3
2b.	Explain in detail the construction and working of (i) serial in serial out (ii) parallel in serial out shift register	05	L2	CO3
<u>Module 4</u>				
3a.	Explain the structure of verilog module with suitable example	05	L2	CO4
3b.	List the different styles of description used in verilog to describe a digital system. Explain Data flow and behavioral verilog description for half adder	05	L3	CO4
(OR)				
4a.	Explain (i) Relational operators with example (ii) Shift operators with example	06	L2	CO4
4b.	Write the verilog HDL dataflow description code for (i) 2 to 1 MUX using conditional operator (ii) 2 to 4 Decoder	04	L3	CO4

CO3 : Students will be able to design and analyse Sequential circuits logic circuits.

→ O4 : Students will be able to Model Combinational circuits (adders, subtractors, multiplexers) and sequential circuits using Verilog descriptions.

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14/5, Chikkasandra
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SAPTHAGIRI COLLEGE OF ENGINEERING, BENGALURU.
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGG.
SCHEME & SOLUTION

Sem. & Sec.: 3A & B

Academic Year:

Date: 28.02.23

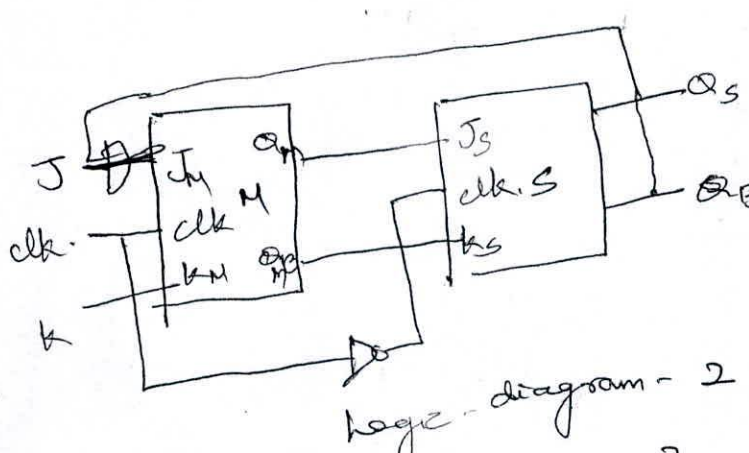
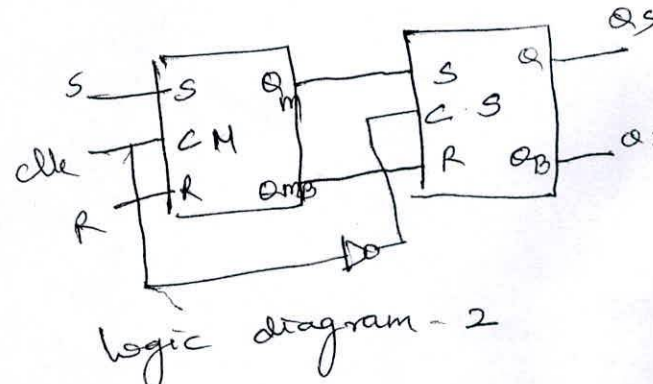
Subject: DSD using verilog

Subject Code: 21EC32

Duration: 1 hr.

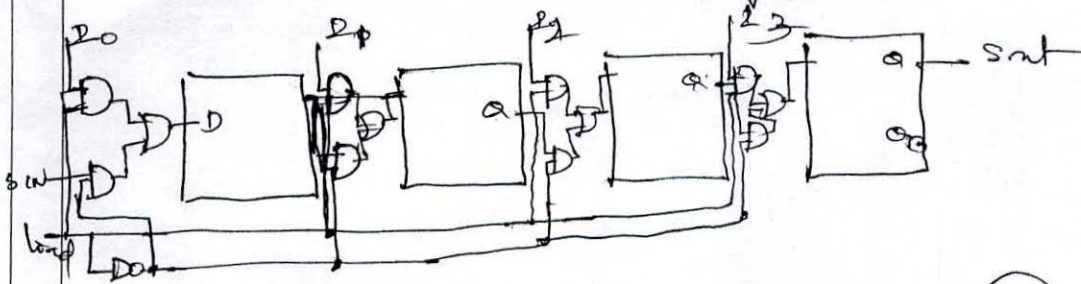
Max. Marks: 20

INTERNAL ASSESSMENT TEST - III

Q. No.	Solutions	Marks Allocated																																																		
1	<u>MS - JK flipflop</u>  logic diagram - 2 working - 4 timing diagram - 2 <u>MS - SR flipflop</u>  logic diagram - 2 working - 4 timing diagram - 2 Truth table-2 <table> <tr> <th>clk</th> <th>J</th> <th>K</th> <th>Qs</th> <th>Qs</th> </tr> <tr> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>1</td> <td>0</td> <td>1</td> <td>0</td> <td>1</td> </tr> <tr> <td>1</td> <td>1</td> <td>0</td> <td>1</td> <td>0</td> </tr> <tr> <td>1</td> <td>1</td> <td>1</td> <td>Qs</td> <td>Qs</td> </tr> </table> Truth table-2 <table> <tr> <th>clk</th> <th>S</th> <th>R</th> <th>Qs</th> <th>Qs</th> </tr> <tr> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>1</td> <td>0</td> <td>1</td> <td>0</td> <td>1</td> </tr> <tr> <td>1</td> <td>1</td> <td>0</td> <td>1</td> <td>0</td> </tr> <tr> <td>1</td> <td>1</td> <td>1</td> <td>undefined</td> <td>undefined</td> </tr> </table> Truth table-2	clk	J	K	Qs	Qs	0	0	0	0	0	1	0	1	0	1	1	1	0	1	0	1	1	1	Qs	Qs	clk	S	R	Qs	Qs	0	0	0	0	0	1	0	1	0	1	1	1	0	1	0	1	1	1	undefined	undefined	10
clk	J	K	Qs	Qs																																																
0	0	0	0	0																																																
1	0	1	0	1																																																
1	1	0	1	0																																																
1	1	1	Qs	Qs																																																
clk	S	R	Qs	Qs																																																
0	0	0	0	0																																																
1	0	1	0	1																																																
1	1	0	1	0																																																
1	1	1	undefined	undefined																																																

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parallel in serial out shift register



SN	load	Q ₀	Q ₁	Q ₂	Q ₃	Sout
1		2 ₀	2 ₁	2 ₂	2 ₃	2 ₃
2	0	0	2 ₀	2 ₁	2 ₂	2 ₂
3	0	0	0	2 ₀	2 ₁	2 ₁
4	0	0	0	0	2 ₀	2 ₀

(2 1/2)

3a) Verilog structure - 2 1/2
example - 2 1/2

module declaration
2/0 port declaration
functional description
end module

3b) module MA(A,B,S,C);
input A,B;
output S,C;
assign S = A & B;
assign C = A ^ B;
end module

- b) (i) dataflow description (ii) gate level description (iii) Behavioral description (iv) ^{switch} ~~mixed~~ level description (v) mixed level description. - (2)

Dataflow of Half adder

module MA(A,B,S,C)
input A,B;
output S,C;
assign S = A & B;
assign C = A ^ B;
end module

module HABehav(A,B,S,C);
input A,B;
output S,C;
reg S,C;
always @ (A) (1)
begin
S = A & B;
C = A ^ B;
end
end module

A	B	S	C
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

SAPTHAGIRI COLLEGE OF ENGINEERING
Department of Electronics and Communication
Internal Assessment Test –I

Subject: ITC

Semester: V

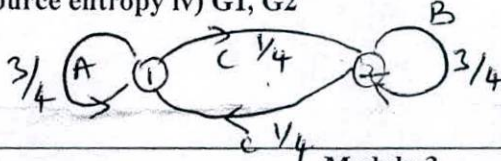
Duration: 1hours

Note: Answer any two full questions, choosing one from each module

Sub Code: 18EC54

Max Marks: 30

Date: 15-11-22

Question No.	Questions	Marks	BLT	CO's																				
Module-2																								
1 a.	Define the following with respect to information theory. (i) Self-information (ii) Entropy (ii) rate of information (iv) Source Efficiency	4 1+1+1+1	L1	CO1																				
b.	Derive the expression for average information content of symbols in long independent sequence.	4	L2	CO1																				
c.	Prove the maximal property of Entropy.	7	L2	CO1																				
OR																								
2 a.	A code is composed of dots and dashes. Assuming that a dash is 3 times as long as a dot and has one-third the probability of occurrence. Calculate: (i) The information in dot and dash 0.415, 2 bits (ii) The entropy of dot and dash 0.8113 bits/symbol	6 2+2+2	L3	CO1																				
b.	Consider the following Markov source shown in fig, Find i) State entropies ii) Source entropy iv) G1, G2 	9 2+3+2+2 $P(A) = P(B) = 1/2$ $H(A) = 1.585$ $G_1 = 1.5564$ $G_2 = 1.3085$	L3	CO1																				
Module-3																								
3 a.	State Kraft inequality. Find the smallest value of 'r' such that prefix codes can be constructed for the following code length requirements. $W = \{1, 4, 4, 4, 5\}$ for corresponding for the following code $L = \{1, 2, 3, 4, 5\}$. Also suggest a suitable code.	8 3+5	L2, L3	CO2																				
b.	State and prove Shannon's source coding theorem.	7	L2	CO2																				
OR																								
4 a.	Apply Shannon encoding theorem and generation codes for the set of symbols $S = \{0.3, 0.25, 0.20, 0.12, 0.08, 0.05\}$. Find code Efficiency and variance.	8 3+3+1	L3	CO2																				
b.	Identify the following codes are instantaneous. Justify your answer. <table border="1"><thead><tr><th>Symbols</th><th>Code A</th><th>Code B</th><th>Code C</th></tr></thead><tbody><tr><td>S1</td><td>00</td><td>1</td><td>0</td></tr><tr><td>S2</td><td>01</td><td>01</td><td>100</td></tr><tr><td>S3</td><td>10</td><td>001</td><td>101</td></tr><tr><td>S4</td><td>11</td><td>00</td><td>111</td></tr></tbody></table> Prefix instantaneous not Prefix not instant not Prefix not instantaneous	Symbols	Code A	Code B	Code C	S1	00	1	0	S2	01	01	100	S3	10	001	101	S4	11	00	111	7 2+2+1/2+2	L3	CO2
Symbols	Code A	Code B	Code C																					
S1	00	1	0																					
S2	01	01	100																					
S3	10	001	101																					
S4	11	00	111																					

CO1: Measure information, Entropy, Rate of Information and Order of a source for Dependent & Independent Source

CO2: Develop Shannon Encoding, Shannon Fano, Prefix and Huffman Encoding Algorithms for the Information source

SCHEME & SOLUTION

Sem. & Sec.: V A & B

Academic Year:

Date: 15/11/22

Subject: ITC

Subject Code: 18EC54

Duration: 1hr

Max. Marks: 30

INTERNAL ASSESSMENT TEST - I

Q. No.	Solutions	Marks Allocated
1.	$I_k = \log_2 \frac{1}{P_k} \text{ bits}$ $H(s) = \sum_{i=1}^q P_i \log_2 \frac{1}{P_i} \text{ bits/m-symbol}$ $R_s = r_s \cdot H(s) \text{ bits/sec}$ $\eta = \frac{H(s)}{L} \%$	1x4 =4
2.	$S = \{s_1, s_2, \dots, s_q\} \quad P = \{P_1, P_2, \dots, P_q\}$ $L \rightarrow$ independent seq of symbols $\rightarrow$ contain info $P_1 L \log_2 \frac{1}{P_1}$ $P_1 L$ no of message of type $s_1 \rightarrow$ " $P_2 L \log_2 \frac{1}{P_2}$ $P_2 L$ " " s_2 " $P_q L \log_2 \frac{1}{P_q}$ $P_q L$ " " $s_q \rightarrow$ $I_{\text{total}} = P_1 L \log_2 \frac{1}{P_1} + \dots + P_q L \log_2 \frac{1}{P_q}$ $= L \sum_{i=1}^q P_i \log_2 \frac{1}{P_i} \text{ bits}$ $\text{Avg self info} = \frac{I_{\text{total}}}{L} = \sum_{i=1}^q P_i \log_2 \frac{1}{P_i} \text{ bits/m-symbol}$	4
3.	$H(s) = \sum_{i=1}^q P_i \log_2 \frac{1}{P_i}$ $\sum_{i=1}^q P_i = 1$ Consider $\log q - H(s)$	

Q. No.	Solutions	Marks Allocated
2b	$P(1) = \frac{3}{4} P(1) + \frac{1}{4} P(2)$ $P(2) = \frac{3}{4} P(2) + \frac{1}{4} P(1) \Rightarrow \frac{1}{4} P(2) = \frac{1}{4} P(1)$ $\boxed{P(1) = P(2) = \frac{1}{2}}$ $P(1) = \frac{3}{4} P(1) + \frac{1}{4} P(1)$ $P(1) + P(2) = 1$ $H_1 = P_{11} \log_2 \frac{1}{P_{11}} + P_{12} \log_2 \frac{1}{P_{12}} = \frac{3}{4} \log_2 \frac{4}{3} + \frac{1}{4} \log_2 4$ $= \frac{0.8075}{1.6887} \text{ bit/s} = 1.6887 \text{ bit/s}$ $H = P(1) \times \frac{0.8075}{1.6887} + P(2) \times \frac{0.8075}{1.6887} = 1.6887 \text{ bit/s}$ $\bar{S} = \{A, B, C\}$ $P(A) = \frac{1}{2} \times \frac{3}{4} = \frac{3}{8}$ $P(B) = \frac{1}{2} \times \frac{3}{4} = \frac{3}{8}$ $P(C) = \frac{1}{2} \times \frac{1}{4} + \frac{1}{2} \times \frac{1}{4} = \frac{2}{8} = \frac{1}{4}$ $G_1 = H(\bar{S}) = \frac{2}{8} \times \frac{3}{8} \log_2 \frac{8}{3} + \frac{1}{4} \log_2 4$ $+ \frac{2}{4} = 1.561 \text{ bit/symbol}$ $G_2 = H(\bar{S}) = 1.27 \text{ bit/symbol}$	2+3+2+6
3a)	$\sum_{i=1}^q r^{-li} \leq 1$ $= 1 \times r^{-1} + 4 \times r^{-2} + 4 \times r^{-3} + 4 \times r^{-4} + 5 \times r^{-5} \leq 1$ $= 2.40625$ take $r=3$ $r = \frac{H(\bar{S})}{\log 3} = \frac{1.27}{\log 3} =$	1M 2M

SAPTHAGIRI COLLEGE OF ENGINEERING
Department of Electronics and Communication
Internal Assessment Test –III

Subject: Machine Learning
Semester: VII(A&B)
Duration: 1hours

Sub Code: 18EC745
Max Marks: 30
Date: 20:01:2022

Note: Answer any two full questions, choosing one from each module

Question No.	Questions	Marks	BLT	CO's																																																							
Module-4																																																											
1 a.	Explain Bayes theorem, MAP Hypothesis and ML Hypothesis	8 <i>5+3+2</i>	L2	CO3																																																							
b.	Explain Brute force MAP learning algorithm	7	L3	CO3																																																							
2 a.	Classify the data and using Naïve Bayes classifier for the data set shown in table. <table><tr><td>N</td><td>Color</td><td>Type</td><td>Origin</td><td>Stolen?</td></tr><tr><td>1</td><td>red</td><td>sports</td><td>domestic</td><td>yes</td></tr><tr><td>2</td><td>red</td><td>sports</td><td>domestic</td><td>no</td></tr><tr><td>3</td><td>red</td><td>sports</td><td>domestic</td><td>yes</td></tr><tr><td>4</td><td>yellow</td><td>sports</td><td>domestic</td><td>no</td></tr><tr><td>5</td><td>yellow</td><td>sports</td><td>imported</td><td>yes</td></tr><tr><td>6</td><td>yellow</td><td>SUV</td><td>imported</td><td>no</td></tr><tr><td>7</td><td>yellow</td><td>SUV</td><td>imported</td><td>yes</td></tr><tr><td>8</td><td>yellow</td><td>SUV</td><td>domestic</td><td>no</td></tr><tr><td>9</td><td>red</td><td>SUV</td><td>imported</td><td>no</td></tr><tr><td>10</td><td>red</td><td>sports</td><td>domestic</td><td>yes</td></tr></table> <i>Red, SUV, imported</i> <i>4+2+2</i>	N	Color	Type	Origin	Stolen?	1	red	sports	domestic	yes	2	red	sports	domestic	no	3	red	sports	domestic	yes	4	yellow	sports	domestic	no	5	yellow	sports	imported	yes	6	yellow	SUV	imported	no	7	yellow	SUV	imported	yes	8	yellow	SUV	domestic	no	9	red	SUV	imported	no	10	red	sports	domestic	yes	8	L3	CO3
N	Color	Type	Origin	Stolen?																																																							
1	red	sports	domestic	yes																																																							
2	red	sports	domestic	no																																																							
3	red	sports	domestic	yes																																																							
4	yellow	sports	domestic	no																																																							
5	yellow	sports	imported	yes																																																							
6	yellow	SUV	imported	no																																																							
7	yellow	SUV	imported	yes																																																							
8	yellow	SUV	domestic	no																																																							
9	red	SUV	imported	no																																																							
10	red	sports	domestic	yes																																																							
b.	Consider a medical diagnosis problem in which there are two alternative hypothesis: (i) That the patient has a particular form of cancer (+) and (ii) That the patient does not (-). A patient takes a lab test and the result comes back positive. The test returns a correct negative result in only 98% of the cases in which the disease is actually present and a correct negative result in only 97% of cases in which the disease is not present. Furthermore, 0.008 of the entire populations have this cancer. Determine whether the patient has cancer or not provided the lab test is positive using MAP hypothesis.	7	L3	CO3																																																							
Module-5																																																											
3 a.	Explain K-nearest neighbor algorithm. List the advantages and disadvantages.	8 <i>4+2+2</i>	L1, L2	CO4																																																							
b.	The height, weight and T-shirt size of some customers is provided in table and predict the T-shirt size of a new customer given < height=161 cm and weight=61 KG> using KNN algorithm with K=3. <table><tr><td>Height in CM</td><td>Weight in KG</td><td>Size of T-shirt</td></tr><tr><td>158</td><td>63</td><td>M</td></tr><tr><td>160</td><td>59</td><td>M</td></tr><tr><td>161</td><td>63</td><td>M</td></tr><tr><td>160</td><td>64</td><td>L</td></tr><tr><td>168</td><td>62</td><td>L</td></tr><tr><td>163</td><td>64</td><td>L</td></tr><tr><td>165</td><td>61</td><td>L</td></tr></table>	Height in CM	Weight in KG	Size of T-shirt	158	63	M	160	59	M	161	63	M	160	64	L	168	62	L	163	64	L	165	61	L	7	L2	CO4																															
Height in CM	Weight in KG	Size of T-shirt																																																									
158	63	M																																																									
160	59	M																																																									
161	63	M																																																									
160	64	L																																																									
168	62	L																																																									
163	64	L																																																									
165	61	L																																																									
4 a.	Explain CADET system using case-based reasoning.	8 <i>4+4</i>	L2	CO4																																																							
b.	Explain Radial Basis functions	7 <i>4+3</i>	L2	CO4																																																							

CO3: Acquire Knowledge and apply neural networks, Bayesian Techniques.

CO4: Apply instant based learning and reinforcement learning algorithms.

Revised Blooms Taxonomy Levels (RBTL): L1-Remembering, L2-Understand, L3-Apply, L4- Analyzing, L5-Evaluating, L6- Creating

SAPTHAGIRI COLLEGE OF ENGINEERING, BENGALURU.
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGG.

SCHEME & SOLUTION

Sem. & Sec.: V A & B
Subject: Machine Learning
Duration: 1 Hr

Academic Year: 2021-22

Date: 20/01/22

Subject Code: 18EC745

Max. Marks: 30

INTERNAL ASSESSMENT TEST - III

Q. No.	Solutions	Marks Allocated
a)	$P(h/D) = \frac{P(D/h) P(h)}{P(D)} \rightarrow \text{Bayes theorem}$ $P(h/D) = \arg \max_{h \in H} P(D/h) \cdot P(h) \quad P(D) \text{ is constant}$ $P(h/D) = \arg \max_{h \in H} P(D/h) \quad \text{MAP hypothesis}$ $P(h) = \text{constant}$ since all the hypothesis are equally probable	8M 3+3+2
b)	$P(h/D) = \frac{P(D/h) \cdot P(h)}{P(D)}$ $h_{\text{MAP}} = \arg \max_{h \in H} P(h/D) \cdot P(h)$ $P(h) = \frac{1}{ H } \quad \forall h \text{ in } H$ $P(D/h) = \begin{cases} 1 & \text{if } d_i = h(d_i) \\ 0 & \text{otherwise} \end{cases} \quad \forall d_i \text{ in } D$ Bayes theorem $P(h/D) = \frac{P(D/h) \cdot P(h)}{P(D)}$ $= \frac{0 \cdot P(h)}{P(D)} = 0 \text{ if } h \text{ is inconsistent with } D$ $P(h/D) = 1 \text{ if } h \text{ is consistent with } D$ $P(h/D) = \frac{1 \cdot \frac{1}{ H }}{P(D)}$	

3a)

For each training ex $\langle x, f(x) \rangle$, add the example to the set containing training ex

Given a query instance x_q

Let $x_1, x_2, \dots, x_n$ — denote training examples

* Return

$$\hat{f}(x_q) \leftarrow \arg \max_{v \in V} \sum_{i=1}^n \delta(v, f(x_i))$$

where $\delta(a, b) = 1$ if $a = b$ otherwise

$$\hat{f}(x_q) = \frac{\sum_{i=1}^n f(x_i)}{n}$$

3b)

$$P(\oplus | \text{cancer}) P(\text{cancer}) = 0.98 \times 0.008 = 0.0078$$

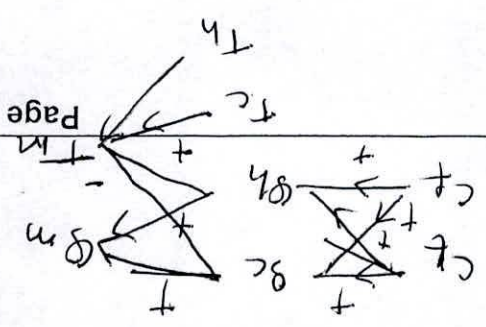
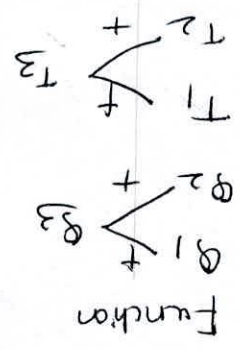
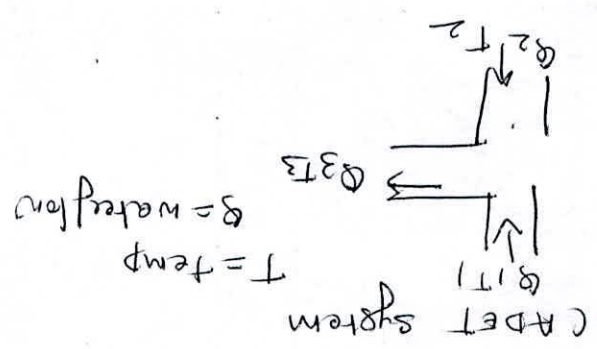
$$P(\oplus | \text{7 cancer}) P(\text{7 cancer}) = 0.03 \times 0.992 = 0.0298$$

b)

1	158	63	3.6	4
2	160	59	2.23	M
3	161	63	2	M
4	160	64	3.16	L
5	168	62	7.07	L
6	163	64	3.6	L
7	165	61	4	L

$$\langle 161, 61 \rangle \succ M$$

4a)





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 14/5, Chikkasandra, Hesaraghatta Main Road, Bengaluru-560057.

Department of Electrical & Electronics Engineering
Internal Assessment Test – I (2022-2023)

Subject: DIGITAL SYSTEM DESIGN

Sub. Code: 21EE42

Semester / Section: 4th (A&B)

Max Marks: 20

Duration: 60 minutes

Date: 03/07/2023

Note: Answer ANY TWO full questions, choosing ONE from each part.

Q No.	Questions	Marks	RBT	CO's
PART - A				
1 a.	Design a three-input, one-output minimal two-level gate combinational circuit which has an output equal to 1 when majority of its inputs are at logic 1 and has an output equal to 0 when majority of its inputs are at logic 0.	05	L2	CO1
b.	Minimize $f(a,b,c,d) = \sum m(0,2,8,10)$ using quine Mccluskey method	05	L3	CO1
OR				
2 a.	Define Combinational logic. List the various steps in designing the combinational logic circuit and explain with the block diagram	04	L2	CO1
b.	Minimize the following multiple output functions using K-MAP: $F = \sum m(1,2,6,7,8,13,14,15) + d(3,5,12)$	06	L3	CO1
PART - B				
3 a.	Expand $f1 = ab + bc + ac$ into minterms	05	L2	CO1
b.	Simplify $f(a,b,c,d,e) = \sum m(0,1,2,3,4,5,16,17,18,19,24,25) + dc(26,27)$ using Karnaugh map technique.	05	L3	CO1
OR				
4 a.	Reduce The Following Function Using K-Map technique $F(A,B,C,D) = \pi M(0,1,4,5,14,15) + dc(12,13)$	04	L3	CO1
b.	Obtain all the prime implicants of the Boolean function using quine-Mccluskey method. $F(a,b,c,d) = \sum (7,9,12,13,14,15) + \sum d(4,11)$	06	L3	CO1

Revised Bloom's Taxonomy (RBT) Levels: L2 – Understanding, L3 – Applying, L4 - Analyzing

CO1: Develop simplified switching equation using Karnaugh Maps and Quine McClusky techniques.

Accepted/ Accepted with modification/ Rejected

Course coordinator

Module Coordinator

HOD.EEE
PROF & HOD

Principal
 Sapthagiri College of Engineering
 14/5, Chikkasandra, Hesaraghatta Main Road
 Bengaluru - 560057

Department of Electrical & Electronics Engineering
 Sapthagiri College of Engineering
 Bangalore - 560057



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Department of Electrical & Electronics Engineering

SCHEME & SOLUTION

Sem. & Sec.: IV A&B

Academic Year: 2022-23

Date of Test: 03/01/23

Subject: Digital System Design

Subject Code: 2PEE42

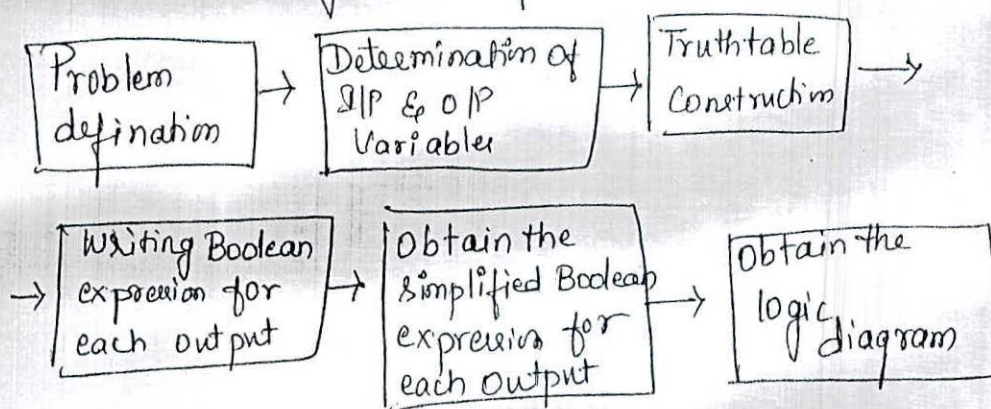
Duration: 1 hour

Max. Marks: 20

INTERNAL ASSESSMENT TEST - 1

Q. No.	Solutions	Marks Allocated																																														
1a.	write truth table with 3 input and one output. <table border="1"> <thead> <tr> <th>a</th> <th>b</th> <th>c</th> <th>y</th> </tr> </thead> <tbody> <tr><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>0</td><td>0</td><td>1</td><td>0</td></tr> <tr><td>0</td><td>1</td><td>0</td><td>0</td></tr> <tr><td>0</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>1</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>1</td><td>0</td><td>1</td><td>1</td></tr> <tr><td>1</td><td>1</td><td>0</td><td>1</td></tr> <tr><td>1</td><td>1</td><td>1</td><td>1</td></tr> </tbody> </table>	a	b	c	y	0	0	0	0	0	0	1	0	0	1	0	0	0	1	1	1	1	0	0	0	1	0	1	1	1	1	0	1	1	1	1	1	5M										
a	b	c	y																																													
0	0	0	0																																													
0	0	1	0																																													
0	1	0	0																																													
0	1	1	1																																													
1	0	0	0																																													
1	0	1	1																																													
1	1	0	1																																													
1	1	1	1																																													
b.	$f(a,b,c,d) = \sum m(0,2,8,10)$. Variable <table border="1"> <thead> <tr> <th>M</th> <th>a</th> <th>b</th> <th>c</th> <th>d</th> </tr> </thead> <tbody> <tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>2</td><td>0</td><td>0</td><td>1</td><td>0</td></tr> <tr><td>8</td><td>1</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>10</td><td>1</td><td>0</td><td>1</td><td>0</td></tr> </tbody> </table> Step1:- <table border="1"> <thead> <tr> <th>m'</th> <th></th> </tr> </thead> <tbody> <tr><td>0</td><td>0000-</td></tr> <tr><td>2</td><td>0010-</td></tr> <tr><td>8</td><td>1000-</td></tr> <tr><td>10</td><td>1010</td></tr> </tbody> </table> Step2:- <table border="1"> <tbody> <tr><td>(0,2)</td><td>00-0-</td></tr> <tr><td>(0,8)</td><td>-000-</td></tr> <tr><td>(2,10)</td><td>-010-</td></tr> <tr><td>(8,10)</td><td>10-0-</td></tr> </tbody> </table> Step3:- <table border="1"> <tbody> <tr> <td>(0,2,8,10)</td> <td>-0-0-</td> <td>$\therefore Y = \bar{b}\bar{d}$</td> </tr> </tbody> </table>	M	a	b	c	d	0	0	0	0	0	2	0	0	1	0	8	1	0	0	0	10	1	0	1	0	m'		0	0000-	2	0010-	8	1000-	10	1010	(0,2)	00-0-	(0,8)	-000-	(2,10)	-010-	(8,10)	10-0-	(0,2,8,10)	-0-0-	$\therefore Y = \bar{b}\bar{d}$	3M <u>2M</u> 5M
M	a	b	c	d																																												
0	0	0	0	0																																												
2	0	0	1	0																																												
8	1	0	0	0																																												
10	1	0	1	0																																												
m'																																																
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10	1010																																															
(0,2)	00-0-																																															
(0,8)	-000-																																															
(2,10)	-010-																																															
(8,10)	10-0-																																															
(0,2,8,10)	-0-0-	$\therefore Y = \bar{b}\bar{d}$																																														

2a. Combinational logic → definition.



explanation

b. $F = \sum m(1, 2, 6, 7, 8, 13, 14, 15) + d(3, 5, 12)$

cd \ ab	00	01	11	10
00	0	1	X	2
01	4	X	5	6
11	X	12	13	14
10	8	9	11	10

$$Y = \bar{a}d + \bar{a}c + \cancel{ab} + ab + a\bar{c}\bar{d}$$

3a. $f_1 = ab + bc + ac$

$$ab = ab(c + \bar{c}) = abc + ab\bar{c} = 7_{10} + 6_{10}$$

$$bc = bc(a + \bar{a}) = abc + \bar{a}bc = 7_{10} + 3_{10}$$

$$ac = ac(b + \bar{b}) = abc + a\bar{b}c = 7_{10} + 5_{10}$$

$$f = \sum m(3, 5, 6, 7)$$

1M

4M

4M

+2M

6M

1M

1M

1M

2M

5M

$$\Sigma m(0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15) = \Sigma m(0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15)$$

$a = D$

	00	01	11	10
00	0	1	3	2
01	4	5	7	6
11	12	13	15	14
10	8	9	11	10

$a = 1$

dc	00	01	11	10
bc	16	17	19	18
00	1	1	1	1
01	20	21	23	22
11	28	29	31	30
10	24	25	27	26

$$Y = \overline{b}\overline{c} + a\overline{c} + \overline{a}\overline{b}d$$

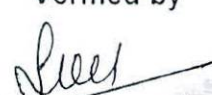
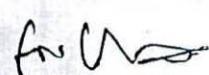
4a. $F(A,B,C,D) = \Sigma m(0,1,4,5,14,15) + dc(12,13)$

	CD	C+D	C+D	C+D	C+D
		00	01	11	10
AB					
A+B	00	0	0	3	2
A+B	01	4	5	7	6
A+B	11	X	X	0	14
A+B	10	8	9	11	10

$$Y = (A+C)(\overline{A}+\overline{B})$$

4b. $F(a,b,c,d) = \Sigma(7,9,12,13,14,15) + \Sigma d(4,11)$

M	Variable	M	Variable
4	0000	13	1101
7	0111	14	1110
9	1001	15	1111
12	1100		
11	1011		

Q. No.	Solutions	Marks Allocated																																																																					
	<u>Step 1:-</u> <table border="1"> <tr><td>4</td><td>0100-</td></tr> <tr><td>12</td><td>1100✓</td></tr> <tr><td>9</td><td>1001-</td></tr> <tr><td>7</td><td>0111</td></tr> <tr><td>11</td><td>1011-</td></tr> <tr><td>13</td><td>1101✓</td></tr> <tr><td>14</td><td>1110-</td></tr> <tr><td>15</td><td>1111✓</td></tr> </table> <u>Step 2:-</u> <table border="1"> <tr><td>4,12</td><td>100 — S</td></tr> <tr><td>9,11</td><td>10 — 1 ✓</td></tr> <tr><td>9,13</td><td>1 — 01 ✓</td></tr> <tr><td>12,13</td><td>110 — ✓</td></tr> <tr><td>12,14</td><td>11 — 0 ✓</td></tr> <tr><td>(7,15)</td><td>— 111 — R</td></tr> <tr><td>(11,15)</td><td>1 — 11 ✓</td></tr> <tr><td>(13,15)</td><td>11 — 1 ✓</td></tr> <tr><td>(14,15)</td><td>111 — ✓</td></tr> </table> <u>Step 3:-</u> (9,11,13,15) 1 — — 1 — P (12,13,14,15) 11 — — — Q <u>Step 4:-</u> <table border="1"> <tr> <th></th> <th>m₇</th> <th>m₉</th> <th>m₁₂</th> <th>m₁₃</th> <th>m₁₄</th> <th>m₁₅</th> </tr> <tr> <td>✓ P</td> <td></td> <td>(X)</td> <td></td> <td>X</td> <td></td> <td>X</td> </tr> <tr> <td>Q</td> <td></td> <td></td> <td>X</td> <td>X</td> <td></td> <td>X</td> </tr> <tr> <td>✓ R</td> <td>(X)</td> <td></td> <td>X</td> <td></td> <td></td> <td>X</td> </tr> <tr> <td>S</td> <td></td> <td></td> <td>(X)</td> <td></td> <td></td> <td></td> </tr> </table> $Y = P + R + Q$ or $P + R + S$ $= ad + bcd + ab$ $ad + bcd + b\bar{c}\bar{d}$	4	0100-	12	1100✓	9	1001-	7	0111	11	1011-	13	1101✓	14	1110-	15	1111✓	4,12	100 — S	9,11	10 — 1 ✓	9,13	1 — 01 ✓	12,13	110 — ✓	12,14	11 — 0 ✓	(7,15)	— 111 — R	(11,15)	1 — 11 ✓	(13,15)	11 — 1 ✓	(14,15)	111 — ✓		m ₇	m ₉	m ₁₂	m ₁₃	m ₁₄	m ₁₅	✓ P		(X)		X		X	Q			X	X		X	✓ R	(X)		X			X	S			(X)				Continue 2M 1M 1M 1M 6M
4	0100-																																																																						
12	1100✓																																																																						
9	1001-																																																																						
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4,12	100 — S																																																																						
9,11	10 — 1 ✓																																																																						
9,13	1 — 01 ✓																																																																						
12,13	110 — ✓																																																																						
12,14	11 — 0 ✓																																																																						
(7,15)	— 111 — R																																																																						
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	m ₇	m ₉	m ₁₂	m ₁₃	m ₁₄	m ₁₅																																																																	
✓ P		(X)		X		X																																																																	
Q			X	X		X																																																																	
✓ R	(X)		X			X																																																																	
S			(X)																																																																				
Prepared by	Verified by	Approved																																																																					
																																																																							
Course coordinator	Module Coordinator	HOD, EEE																																																																					
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Department of Electrical & Electronics Engineering

Internal Assessment Test – I (2022-2023)

Subject: **CONTROL SYSTEM**

Semester/Section: **6th A**

Duration: **1 hour**

Sub. Code: **18EE61**

Max Marks: **30**

Date: **24-04-2023**

Note: Answer ANY TWO full questions, choosing ONE from each part

Q. No.	Questions	Marks	RBT	CO's
PART - A				
1 a.	Compare open loop and closed loop control system with examples	6	L2	CO1
1 b.	Construct mathematical model for the mechanical system shown in fig(1b). Then draw its forced voltage and force current analogy.	9	L4	CO1
OR				
2 a.	Explain the synchro's as an error detector	6	L4	CO1
2 b.	Obtain the electrical network based on torque voltage & current analogy and give all the performance equation for the fig(2b).	9	L4	CO1
PART - B				
3 a.	Derive the transfer function of armature-controlled D.C Servomotor with block diagram.	9	L2	CO1
3 b.	Illustrate how to perform the following in connection with block diagram reduction rules i) Shifting take-off point before a block. ii) Shifting summing point after a block. iii) Blocks in parallel.	6	L3	CO2
4 a.	Explain construction and working principle of AC servomotor.	9	L2	CO1
4 b.	Find the closed loop transfer function of the system shown in fig(4b) using block diagram reduction rules	6	L4	CO2

Revised Bloom's Taxonomy (RBT) Levels: L2-Understand, L3 – Applying, L4- Analyzing

CO1– Determine the transfer function of a linear time invariant system.

CO2 - Apply block diagram manipulation techniques and signal-flow graph to obtain transfer function of LTI system.

Accepted/Accepted with modification/Rejected

Course coordinator

Module coordinator

HOD, EEE

Principal
 Sapthagiri College of Eng.
 14/5, Chikkasandra, Hesaraghatta Main Road,
 Bengaluru - 560 057

PROF & HOD
 Department of Electrical & Electronics Engineering
 Sapthagiri College of Engineering
 Bengaluru - 560057



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14/5, Chikkasandra, Hesaraghatta Main Road, Bengaluru-560057.

Department of Electrical & Electronics Engineering

SCHEME & SOLUTION

Sem. & Sec.: VI

Academic Year: 2022-23

Date of Test: 24/4/23

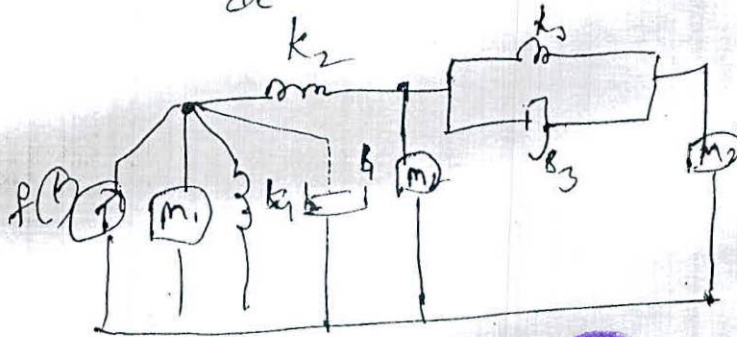
Subject: $G^h A$

Subject Code: 18EE61

Duration: 1hr

Max. Marks: 30

INTERNAL ASSESSMENT TEST - I

Q. No.	Solutions	Marks Allocated
1a)	comparision b/w open loop control system & closed loop system.	6
1b)	$F_1(t) = M_1 \frac{d^2 x_1}{dt^2} + B_1 \frac{dx_1}{dt} + K_1 x_1(t) + K_2 (x_1(t) - x_2(t))$ $F_2(t) = M_2 \frac{d^2 x_2}{dt^2} + K_2 (x_2 - x_1) + K_3 (x_3 - x_2) + B_3 \left(\frac{dx_2}{dt} - \frac{dx_3}{dt} \right)$ $D = M_3 \frac{d^2 x_3}{dt^2} + B_3 \left(\frac{dx_2}{dt} - \frac{dx_3}{dt} \right) + K_3 (x_3 - x_2)$ 	9

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2a) Synchro's as an error detector
- Explanation

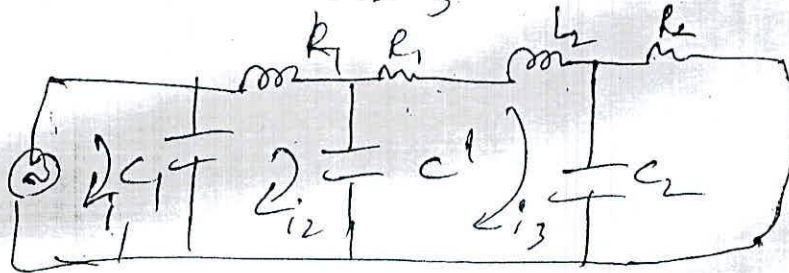
- 6 -

2b)

$$T(\theta) = k_1 (\theta_1 - \theta_2)$$

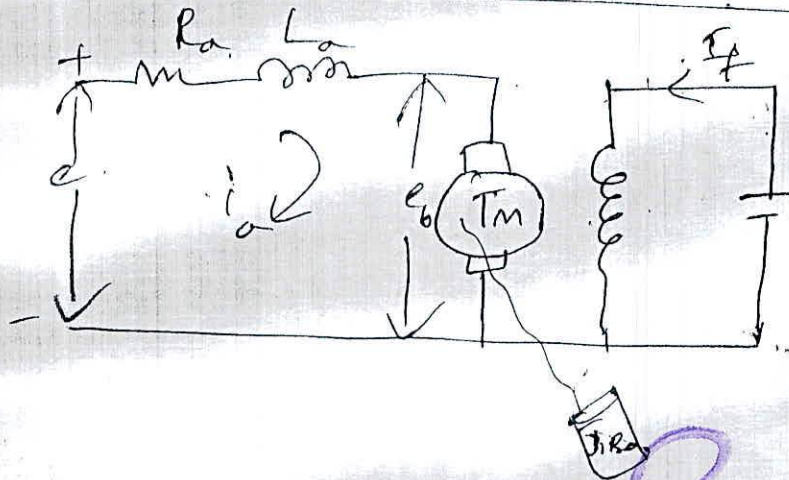
$$0 = J_1 \frac{d^2 \theta_2}{dt^2} + B_1 \frac{d\theta_2}{dt} + k_1 (\theta_2 - \theta_1) + k' \left(\theta_2 - \theta_3 \right) + B' \left(\frac{d\theta_2}{dt} - \frac{d\theta_3}{dt} \right)$$

$$0 = k' (\theta_3 - \theta_2) + B' \left(\frac{d\theta_3}{dt} - \frac{d\theta_2}{dt} \right) + J_2 \frac{d^2 \theta_3}{dt^2} + B_2 \frac{d\theta_3}{dt} + k_2 \theta_3$$



3a)

Armature controlled DC servomotor



$$\phi \propto \Sigma f$$

$$\phi = k_f \Sigma f$$

$$T_m \propto \phi \cdot \dot{\phi}$$

$$T_m = k_t k_f i \dot{\phi}$$

$$e_b \propto \frac{d\phi}{dt}$$

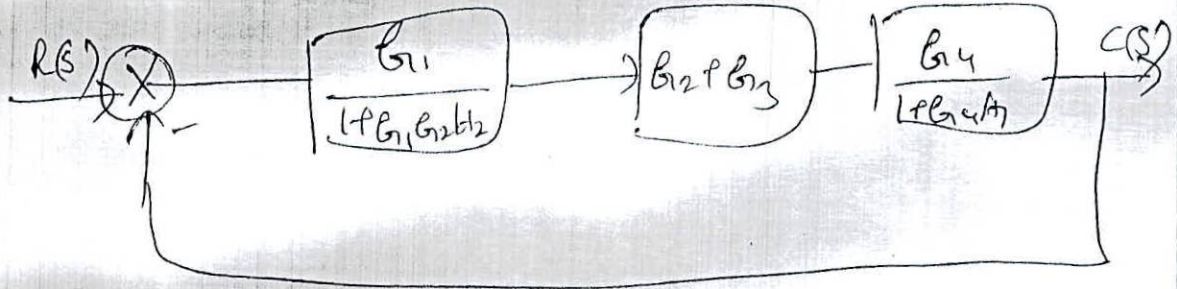
$$e_b = K_b \frac{d\phi}{dt}$$

$$\frac{\phi(s)}{k(s)} = \frac{k_r}{s[(J s + b_0)(L s + R_0) + k_f k_b]}$$

- 3b) i) shifting take-off point before a block
 ii) shifting summing point
 iii) blocks in parallel.

4a) construction & working principle
 of AC servomotor

4b) Block diagram reduction rules



$$\frac{C(s)}{R(s)} = \frac{G_1 G_4 (G_2 + G_3)}{(1 + G_1 G_2 H_2) (1 + G_4 H_1) + G_1 G_4 (G_2 + G_3)}$$

Prepared by

Ramy
Course coordinator

Verified by

Ramy
Module Coordinator

Approved

[Signature]
HOD, EEE



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Department of Electrical & Electronics Engineering

INTERNAL ASSESSMENT TEST – 1 (2022-2023)

Subject: **POWER SYSTEM OPERATION AND CONTROL**

Sub. Code: **18EE81**

Semester / Section: **VIII / A & B**

Max Marks: **30**

Duration: **1 hour**

Date: **17-03-2023**

Note: Answer ANY TWO full questions, choosing ONE from each part.

Q. No.	Questions	Marks	RBT	CO
<u>PART – A</u>				
1 a.	List out various key concepts available for reliable operation of a power system and explain them in detail.	10	L2	CO1
1 b.	Classify the SCADA systems based on number of RTUs, and master stations present in the system and explain each type in detail with a neat configuration diagram.	10	L2	
OR				
2 a.	List out the operating states of a power system and explain them with a neat block diagram.	10	L2	CO1
2 b.	List out the major components of SCADA systems and explain them in detail. Explain various functions of RTU communication subsystem.	10	L2	
<u>PART – B</u>				
3.	Explain the load frequency control and excitation voltage regulators of a turbo generator with a neat schematic diagram. Develop a mathematical model of steam turbine used in a generating station.	10	L2, L3	CO2
OR				
4.	Develop the mathematical model of a speed governing system of a turbo-generator with usual notations.	10	L3	CO2

Revised Bloom's Taxonomy (RBT) Levels: L2 – Understanding, L3 - Applying

CO1: Describe various levels of controls in power systems, components, architecture, and configuration of SCADA.

CO2: Build mathematical models of ALFC by identifying the basic control loops in generator and functions of AGC in an isolated and interconnected systems.

Accepted / Accepted with modification / Rejected.

Pooja
 Course coordinator

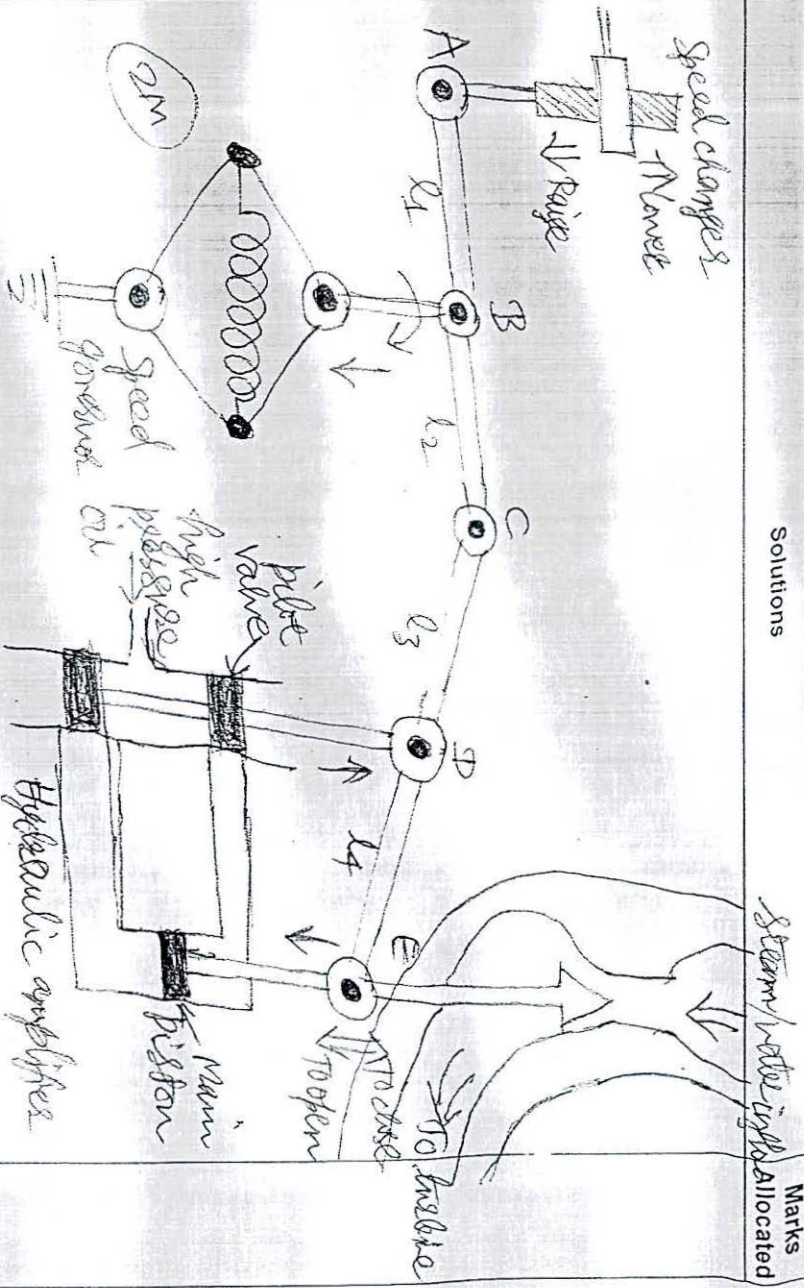
Phani
 Module Coordinator

Pr
 HOD, Dept. of EEE
 PROF & HOD

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4 Speed changes
↑ Move
↓ Raise



$$\Delta y_A = K_C \Delta P_C$$

Movement of point A (Δy_A) contributes to movement of point.

$$\Delta y_C = -\left(\frac{l_2}{l_1}\right) \Delta y_A = -K_3 \Delta y_A = -K_2 K_C \Delta P_C$$

Movement of point B (proportional to $K_2 \Delta f$) contributes to the movement of point C.

$$\Delta y_C = \left(\frac{l_1 + l_2}{l_1}\right) K_2 \Delta f = K_2 \Delta f$$

$\therefore$ Net movement of point C is, $\Delta y_C = \Delta y_C + \Delta y_C$

$$\Rightarrow \Delta y_C = -K_1 K_C \Delta P_C + K_2 \Delta f \quad \text{--- (1)}$$

Movement of point D is contributed by movement of points

$$C \& E. \quad \Delta y_D = \left(\frac{l_3}{l_3 + l_4}\right) \Delta y_C + \left(\frac{l_3}{l_3 + l_4}\right) \Delta y_E = K_3 \Delta y_C + K_4 \Delta y_E \quad \text{--- (2)}$$

Movement of point D makes point E to move and opens steam valve. Volume of oil admitted $\propto$ time integral of Δy_D .

$$\therefore \Delta y_E = K_5 \int (-\Delta y_D) dt \quad \text{--- (3)}$$

$$\Rightarrow \Delta y_C(s) = -K_1 K_C \Delta P_C(s) + K_2 \Delta f(s)$$

$$\Delta y_D(s) = K_3 \Delta y_C(s) + K_4 \Delta y_E(s)$$

$$\Delta y_E(s) = K_5 \int \Delta y_D(s) = -\frac{K_5}{s} \Delta y_D(s) \quad \text{--- (4)}$$

Rearranging above equation & simplifying,



SAPTHAGIRI COLLEGE OF ENGINEERING
Department of Information Science and Engineering
Internal Assessment -I

Subject: Data structure and application
Semester/Section: III 'A' & 'B'
Duration: 1 hours

Sub Code:21CS32
Max Marks: 20

Date: 28-11-2022

Note: Answer any two full questions, choosing one from each module

Question No.	Questions	Marks	BLT	COs
<u>Module-1</u>				
1 a.	Define Data Structures. Summarize various types of data structure	5M	L1	CO1
b.	Illuminate any 2 Data Structures operations with an example.	5M	L2	CO1
OR				
2 a.	Illustrate various memory allocation Function in detail	5M	L2	CO1
b.	Design a C program to implement a linear search.	5M	L2	CO1
<u>Module-1</u>				
3 a.	What is a structure? Illustrate different ways of defining a structure with example for each.	5M	L2	CO1
b.	Apply the array representation of two polynomials: $A(x) = 2x^{1000} + 1$ and $B(x) = x^4 + 10x^3 + 3x^2 + 1$. Write a c function to add two polynomial A(x) and B(x) term by term to produce C(x), where $C(x) = A(x) + B(x)$	5 M	L2	CO1
OR				
4 a.	Give the ADT for sparse matrix. Express the given sparse matrix in the triplet form and find its transpose $A = \begin{bmatrix} 10 & 0 & 0 & 10 \\ 11 & 0 & 22 & 0 \\ 0 & 0 & 0 & 0 \\ 20 & 0 & 0 & 50 \\ 0 & 15 & 0 & 25 \end{bmatrix}$	5M	L3	CO1
b.	Show Binary Search algorithm with an example.	5M	L2	CO1

CO1:Identify different data structures and their applications.

Course Coordinator

Module Coordinator

H.R.R.
HOD

Dr H.R Ranganatha
Prof. & H.O.D

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DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

SCHEME & SOLUTION

Semester: III

INTERNAL TEST - I

Date: 28/11/2022

Subject: DSA

Subject Code: 21C832

Staff Name: Chandra Shekar

Time: 3 to 4 PM

Duration: 1 hour

Max Marks: 20

Signature: CS

QS. No.	Solutions	Marks Allocated
1)a)	Definition of data structures Types of data structures. * Primitive :- int, float, char, double * Non primitive :- Linear D.S, Non-linear D.S	1 M - 4 M
1)b)	Data structure Operations :- * Traversing * Searching * Insertion * Deletion * Sorting * Merging	5 M
2)a)	Various memory allocation functions :- * malloc () * calloc () * realloc () * free ()	2 M 1 M 1 M 1 M

45

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DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

SCHEME & SOLUTION

INTERNAL TEST

Master:

ite:

aff Name:

Time:

Subject:

Duration:

Subject Code:

Max Marks:

Signature:

S.
o.

Solutions

Marks
Allocated

b) Binary search algorithm
Example

4 M

1 M

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USN																			
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Department of Information Science and Engineering

INTERNAL - I

Academic year : 2022-23(Odd Sem)

Sub name : Computer Networks and Security

Sub-code : 18CS52 Date:14/11/22

Sem: V A & B

Questions Module 1 & 2	Mark s	Bloom s Taxon omy level	Course Outcom es Mappe d
1.a.Explain Http request and response message format?	8	L2	CO1
1.b.What are the different transport services available to applications? Explain?	7	L2	CO1
OR			
2.a. Classify and explain 3 Mail Access Protocols?	8	L3	CO1
2.b. Illustrate how user 1 can send mail to user 2 and how user 2 receives the mail by using SMTP?	7	L4	CO1
Module 1 & 2			
3.a.Extend the steps involved in Multiplexing and Demultiplexing?	8	L2	CO2
3.b. Write a note on UDP and TCP and its services?	7	L2	CO2
OR			
4.a.Explain Multiplexing and demultiplexing with respect to UDP and TCP?	8	L2	CO2
4.b Indicate various field of UDP Segment. Explain briefly how checksum is calculated.	7	L2	CO2
CO1	Explain principles of application layer protocols		
CO2	Recognize transport layer services and infer UDP and TCP protocols		

Course Co-ordinator

Module Co-ordinator

HOD

Dr H.R Ranganatha
Prof. & H.O.D

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DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

SCHEME & SOLUTION

INTERNAL TEST I

Register: S

Date: 14/11/22

Staff Name: Swetha KB

Subject:

Time: 1:45 - 2:45

Duration: 1

Subject Code: 18CS52

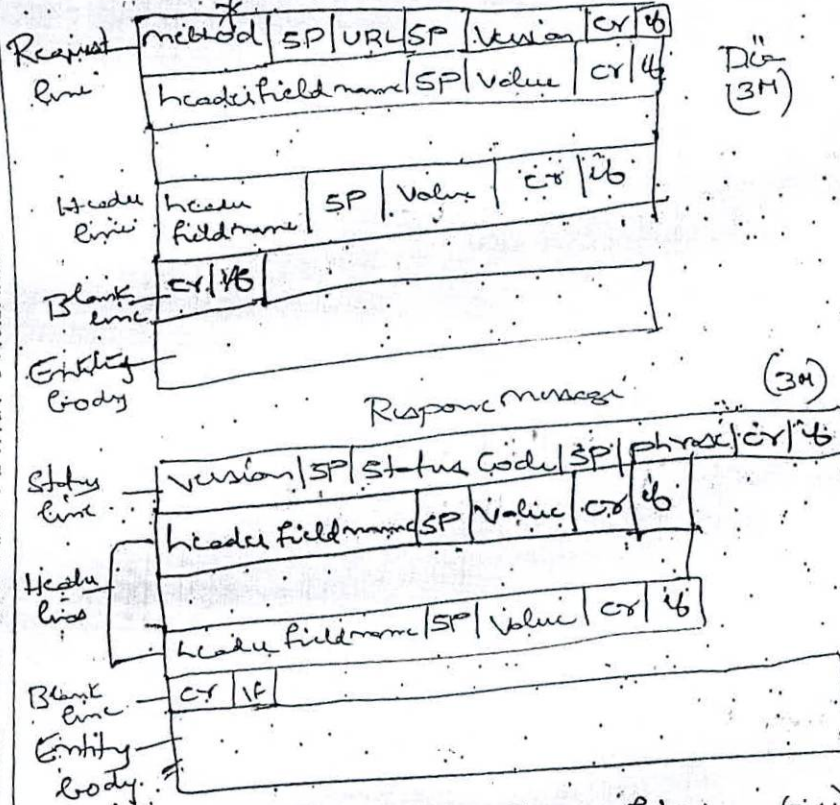
Max Marks: 30

Signature: Swetha KB

Solutions	Marks Allocated
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1a. Http request and response message format

8M
3+3+2=8



Explanation of all types and fields - (2M)

- 1b. Different Transport Services available to applications:
- 1] Reliable Data Transfer
 - 2] Throughput

(Signature)

3] Timing
4] Security
Explanation of all services

$$4 \times 2 = 8$$

$$[81]$$

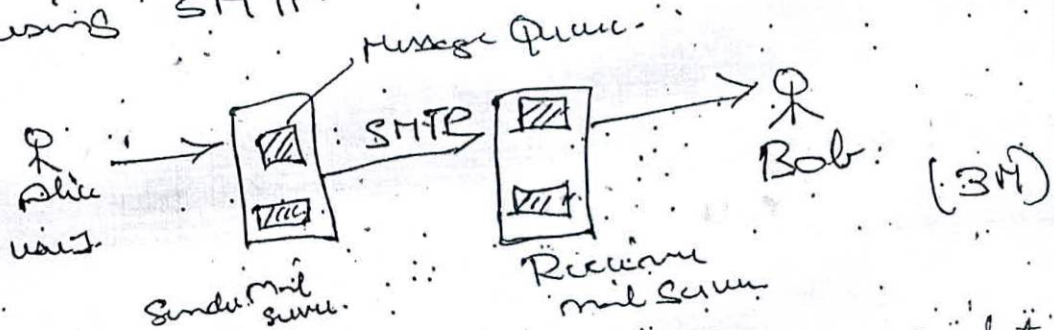
OR

2a. 3 Mail Access Protocols

1] POP	Authentication	Download and keep	(5M)
2] IMAP	Transaction up etc.	Download and Delete	(2M)
3] Web-based E-mail			(1M)

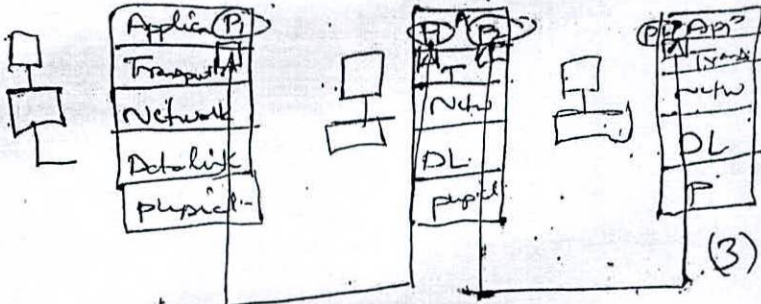
Explanation of all the 3 protocols:

2b. User 1 can send mail to user 2 and how user 2 receives the mail by using SMTP.



Explanation of the steps to Commendate (S.M.)

3M + 5M = 8M

Qs. No.	Solutions	Marks Allocated
3a	Steps involved in Multiplexing and Demultiplexing.  ○ process □ Socket Multiplexing: Gather data-chunks, Create segment, encapsulate with header (2M) Demultiplexing: Delivering data in a segment to correct socket (2M) Explanation of all the Concepts 	3+2+2+1 = 8M
3b	UDP TCP Explanation of Concepts Connectionless Connection Oriented Unreliable Reliable No Congestion Congestion Control	3+4 = 7M

Qs. No.	Solutions	Marks Allocated																				
4a	<u>OR</u> Multiplexing and Demultiplexing with respect to UDP and TCP. <u>Connectionless UDP</u> <u>Connection oriented TCP</u> <table border="1"> <tr> <th colspan="2">2-tuples UDP</th> <th colspan="2">4-tuples TCP</th> </tr> <tr> <td>Destination IP address</td> <td></td> <td>Source IP address</td> <td></td> </tr> <tr> <td>Destination port no</td> <td></td> <td>Source port no</td> <td></td> </tr> <tr> <td>Explanation</td> <td></td> <td>Destination port no</td> <td></td> </tr> <tr> <td></td> <td></td> <td>Destination IP address</td> <td></td> </tr> </table> 4b] UDP Segment → Diagram + Explanation (2) (2) checksum calculation - Explanation (3)	2-tuples UDP		4-tuples TCP		Destination IP address		Source IP address		Destination port no		Source port no		Explanation		Destination port no				Destination IP address		8M.
2-tuples UDP		4-tuples TCP																				
Destination IP address		Source IP address																				
Destination port no		Source port no																				
Explanation		Destination port no																				
		Destination IP address																				
		2+2+3 = 7M																				

[Signature]

Principal



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Department of Information Science and Engineering
Internal Assessment –II

Subject: Artificial Intelligence and Machine learning
 Semester/Section: VII A & B
 Duration: 1 hour

Sub Code: 18CS71

Max Marks: 30

Date: 15-11-2022

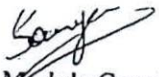
Note: Answer any two full questions, choosing one from each module

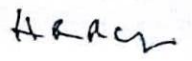
Q. No.	Questions	Marks	BLT	CO's
Module-2				
1 a.	Consider the following predicates i) Man (Marcus) ii) Pompeian (Marcus) iii) born (Marcus, 40) iv) $\forall x; \text{man}(x) \rightarrow \text{mortal}(x)$ v) $\forall x; \text{Pompeian}(x) \rightarrow \text{died}(x, 79)$ vi) erupted (volcano, 79) vii) $\forall x; \forall t_1; \forall t_2; \text{mortal}(x) \wedge \text{born}(x, t_1) \wedge \text{gt}(t_2 - t_1, 150) \rightarrow \text{dead}(x, t_2)$ viii) now = 1991 ix) $\forall x; \forall t; [\text{alive}(x, t) \rightarrow \neg \text{dead}(x, t)] \wedge [\neg \text{dead}(x, t) \rightarrow \text{alive}(x, t)]$ x) $\forall x; \forall t_1; \forall t_2; \text{died}(x, t_1) \wedge \text{gt}(t_2, t_1) \rightarrow \text{dead}(x, t_2)$ Prove that: $\neg \text{alive}(\text{Marcus}, \text{now})$ Show and prove that marcus is dead now.	7	L3	C02
b.	Explain the i) issues in knowledge representation ii) Forward and backward reasoning	8	L2	C02
OR				
2 a.	Explain the algorithm to convert predicate to clausal OR CNF form with example.	9	L2	C02
b.	Consider the following sentences: i) John likes all kinds of food ii) Apples are food iii) Chicken is food iv) Anything anyone eats and isn't killed by is food. v) Bills eats peanuts and is still alive vi) She eats everything Bill eats. Translate these sentences into formulas in predicate logic.	6	L3	C02


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<u>Module-3</u>				
3 a.	Illustrate the ID3 algorithm for decision tree learning with example also mention advantages and limitations of decision ID3 algorithm	10	L2	CO2
b	Discuss how a single perceptron can be used to represent the Boolean functions such as AND and OR?	5	L2	CO2
OR				
4 a.	Differentiate between Gradient Descent and Stochastic Gradient Descent	7	L3	CO2
b.	Illustrate back propagation algorithm	8	L2	CO2
CO2	Illustrate the working of AI and ML Algorithms.			


Course Coordinator


Module Coordinator


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DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

SCHEME & SOLUTION

INTERNAL TEST II

Subject: VII A & B

Time: _____

Subject: AI & ML

Duration: 1 hr

Subject Code: 18CS71

Max Marks: 30

Signature: Soumya

Qu	Solutions	Marks Allocated
1	valide (marus, now) (9) ↑ dead (marus, now) (10) ↑ Died (Marus, t) Agt (now, t) ↑ compres (Marus) Agt (now, 79) ↑ gt (now, 79) ↑ gt (991, 79) ↑ nil	7M
b	issues in knowledge representation - important attributes - relationship among attributes - choosing the granularity - representing sets of objects forward & backward reasoning <u>Reason forward from initial states</u> Begin building a tree of move sequences that might be solution by starting with initial configuration <u>Reason backward from goal states</u> Begin building a tree of move sequences that might be solution by starting with the goal configuration	4M

Qs. No.	Solutions	Mark Allocated
2a)	Eliminate $\rightarrow$ using the fact $a \rightarrow b$ is equivalent to $\neg a \vee b$.	
b)	Reduce the scope of each $\neg$ to a single term	
c)	Standardize variables so that each quantifier binds a unique variable;	
d)	Move all quantifiers to the left of the formula without changing their relative order.	
e)	Eliminate existential quantifier.	
f)	Drop the prefix	
g)	Convert into matrix in conjunction of disjuncts.	9 M
h)	Create a separate clause corresponding to each conjunct	
i)	Standardize apart the variables in the set of clauses generated in step 8. Explanation with examples	
B)		
i)	$\forall x: \text{food}(x) \rightarrow \text{like}(\text{John})$	
ii)	$\text{food}(\text{Apples})$	
iii)	$\text{food}(\text{chicken})$	
iv)	$\forall x, \forall y: \text{Eat}(x, y) \wedge \neg \text{chilled}(x) \rightarrow \text{food}(y)$	6 M
v)	$\text{Eats}(\text{Bill}, \text{Peanuts}) \wedge \text{Alive}(\text{Bill})$	
vi)	$\forall x: \text{Eats}(\text{Bill}, x) \rightarrow \text{Eat}(\text{Shi}, x)$	

Qs. No.	Solutions	Marks Allocated															
3a)	ID3 (Examples, Target attribute, Attributes) Create a root node for tree - If all examples are positive return the single node tree root with label = + - If all examples are negative return the single node tree root with label = - - If attributes is empty return the single node tree root with label = most common value of target attributes - Otherwise begin $A \leftarrow$ the attributes from attributes that best * classifies examples - The decision attribute for root $\leftarrow A$ - for each possible value v of A - add a new tree branch below root corresponding to test $A=v$ - let examples v_i be subset of examples that have value v for A Limitation of ID3 - Examples - Attributes	5M 2M 3M 5M															
b)	<table border="1"> <thead> <tr> <th>A</th><th>B</th><th>A AND B</th></tr> </thead> <tbody> <tr><td>0</td><td>0</td><td>0</td></tr> <tr><td>0</td><td>1</td><td>0</td></tr> <tr><td>1</td><td>0</td><td>0</td></tr> <tr><td>1</td><td>1</td><td>1</td></tr> </tbody> </table> <pre> graph LR A((A)) -- 0.6 --> E((E)) B((B)) -- 0.6 --> E E -- "weighted sum" --> Out((0.1)) Out --> Output((output)) </pre>	A	B	A AND B	0	0	0	0	1	0	1	0	0	1	1	1	
A	B	A AND B															
0	0	0															
0	1	0															
1	0	0															
1	1	1															

Qs. No.	Solutions	Marks Allocated
4a.	In standard gradient descent the error is summed over all examples before updating weights whereas in stochastic summing over multiple networks in standard gradient descent requires more computation per weight update step. In cases where there are multiple local minima with respect to stochastic gradient descent can sometimes avoid falling in to these local minima because it uses various $\nabla_{\vec{w}} J(\vec{w})$.	7M
b.	Back Propagation Algorithm 1. Input the instance x to the network & compute the output O_k 2. For each network output unit k calculate its error term δ_k $\delta_k \leftarrow O_k(1 - O_k)(t_k - O_k)$ 3. $\delta_h \leftarrow O_h(1 - O_h) \sum_{k \in \text{outputs}} w_{hk} \delta_k$ 4. update each network weight w_{ji} $w_{ji} \leftarrow w_{ji} + \Delta w_{ji}$ $\Delta w_{ji} = \eta \delta_j x_{ji}$	8M





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Department of Information Science and Engineering

USN

Internal Assessment Test - I

Subject: Design & Analysis of Algorithms
Semester/Section: IV 'A' & 'B'
Duration: 1 hours

Sub Code: 21CS42

Max Marks: 20

Date: 03/7/2023

Note: Answer any two full questions

Q. No.	Questions	Marks	BLT	CO's
Module 1				
1 a.	Explain the notion of algorithm. Design Euclid's algorithm for computing GCD(m,n). Find GCD(60,24) using Euclid's algorithm.	3	L2	CO1
b.	Explain different asymptotic notations with example.	2	L2	CO1
c.	Explain the general plan for the efficiency of a non-recursive algorithm. Design and analyze algorithm for finding the largest element in the given array.	5	L2	CO1
OR				
2 a.	Explain with a neat diagram Fundamentals of Algorithmic Problem solving.	5	L2	CO1
b.	Discuss an algorithm for Tower of Hanoi problem and find its efficiency.	5	L2	CO1
Module 1				
3 a.	Construct an algorithm to find uniqueness of elements in an array and give the time complexity.	5	L3	CO1
b.	Develop an algorithm for selection sort. Trace the algorithm to sort the following numbers in ascending order. 80 60 70 40 10 30 50 20	5	L3	CO1
OR				
4 a.	Explain Bruteforce technique and String Matching algorithm with tracing. Pattern: happy Text: It is never too late to have a happy childhood.	5	L2	CO1
b.	Construct an algorithm for bubble sort and derive its complexity. Trace the algorithm for the following numbers. 60 50 25 10 35 25 75 30	5	L3	CO1

CO1: Analyse the running times of algorithms and state the performance using asymptotic notations and also to analyse mathematically for the complexity of the algorithm.

[Signature]
Course Coordinator

[Signature]
Module Coordinator

[Signature]
Program Coordinator
(HOD)

Dr H.R Ranganatha
Prof. & H.O.D

Dept of Information Science & Engg

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[Signature]
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SAPTHAGIRI COLLEGE OF ENGINEERING
DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

SCHEME & SOLUTION

INTERNAL TEST Ist

Semester: 4th A & B

Date: 31/7/23

Staff Name: Ambika S

Time: 10:30 am

Subject: DAA

Duration: 1 hr

Subject Code: 21CS42

Max Marks: 20

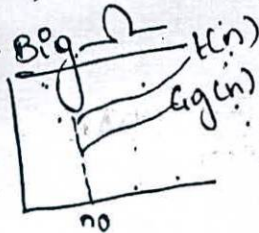
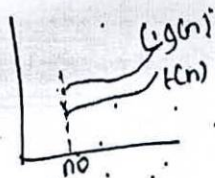
Signature: A. S.

Qs. No.	Solutions	Marks Allocated															
1a	problem ↓ Algorithm ↓ Program ↓ Input → <u>Computer</u> → Output Algorithm Euclid (m, n) // Description: Computes gcd(m, n) by Euclid's algorithm. // Input: Two non negative, not both zero m & n // Output: Greatest common divisor of m & n where n ≠ 0 do $d \leftarrow m \bmod n$ $m \leftarrow n$ $n \leftarrow d$ return m GCD - (60, 24) <table> <tr> <td>m</td> <td>n</td> <td>r</td> </tr> <tr> <td>60</td> <td>24</td> <td>12</td> </tr> <tr> <td>24</td> <td>12</td> <td>12</td> </tr> <tr> <td>12</td> <td>12</td> <td>0</td> </tr> <tr> <td><u>12</u></td> <td>0</td> <td></td> </tr> </table> <u>GCD (60, 24) = 12</u>	m	n	r	60	24	12	24	12	12	12	12	0	<u>12</u>	0		<u>1/2 M</u> <u>1 M</u> <u>1 M</u> <u>3 M</u>
m	n	r															
60	24	12															
24	12	12															
12	12	0															
<u>12</u>	0																

1b.

Asymptotic notations

Big O



1c. General plan.

- ① Decide input size.
- ② Identify the algorithm's basic operation.
- ③ No. of times the basic operation is executed depends only on the size of an input.
- ④ Set up a sum expressing the no. of times the algorithm's basic operation is executed.
- ⑤ Use standard formulas & rules to calculate order of growth.

Algorithm MaxElement ($A[0 \dots n-1]$)

maxval $\leftarrow A[0]$

for $i \leftarrow 1$ to $n-1$ do

if $A[i] > \text{maxval}$
maxval $\leftarrow A[i]$

return maxval

2a.

Understand the problem

- Decide on : Computational means
- 1) Exact vs. approximate solving
 - 2) Algorithm design technique

Design the algorithm

prove the correctness

Analyze the algorithm

code the algorithm

[Signature]

Principal

Qs. No.	Solutions	Marks Allocated
2b.	Tower of Hanoi problem. Algo TowerOfHanoi (n, source, dest, aux) If $n = 1$, then move disk from source to dest else TowerOfHanoi (n-1, source, aux, dest) move disk from source to dest TowerOfHanoi (n-1, aux, dest, source) Endif <u>$\Theta(n)$</u>	5M
3a.	Find uniqueness of elements in array. Algorithm UniqueElement (A[0...n-1]) // Distinct // Input // Output for $i \leftarrow 0$ to $n-2$ do for $j \leftarrow i+1$ to $n-1$ do if $A[i] = A[j]$ return false return true <u>$\Theta(n^2)$</u>	5M

Qs. No.	Solutions	Marks Allocated
3b.	Algorithm. Selection Sort ($A[0 \dots n-1]$) // Sort // Input // Output for $p \leftarrow 0$ to $n-2$ do $min \leftarrow p$ for $j \leftarrow p+1$ to $n-1$ do if $A[j] < A[min]$ $min \leftarrow j$ swap $A[p]$ and $A[min]$ Teaching	5 M
4a.	Algorithm. String Match ($T[]$, $P[]$) // String Match // I/P // O/P for $i \leftarrow 0$ to $n-m$ do $j \leftarrow 0$ while $j < m$ and $P[j] \neq T[i+j]$ do $j \leftarrow j+1$ if $j = m$ return e return -1 Teaching	5 M
4b.	Algorithm Bubble ($A[0 \dots n-1]$) // Sort // I/P // O/P for $i \leftarrow 0$ to $n-2$ do for $j \leftarrow 0$ to $n-2-i$ do if $A[j+1] < A[j]$ swap $A[j]$ & $A[j+1]$ Teaching	5 M

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SAPTHAGIRI COLLEGE OF ENGINEERING
Department of Information Science and Engineering

Internal Assessment Test-II

Subject: File Structures
Semester/Section: 6th 'A & B'
Duration: 1 hours

Sub Code: 18IS61
Max Marks: 30
Date: 31-05-2023

Note: Answer any two full questions, choosing one from each module

Question No.	Questions	Marks	BLT	CO's
MODULE-2				
1 a.	Write an algorithm for searching a record from a file using binary search.	7	L3	CO2
b.	Demonstrate the key sorting algorithm, with an example.	8	L3	CO2
OR				
2 a.	Define indexing. Explain a simple-index for entry-sequenced files, selective indexing & Binding with example.	8	L1,L2	CO2
b.	Analyze the concept of indexing to provide access by multiple keys.	7	L3	CO2
MODULE-3				
3 a.	Write a note of the following: i) K-way merge ii) A selection tree for merging large number of lists.	7	L3	CO3
b.	Write an algorithm for Heap sorting method for insertion. Show the construction of heap tree for following sequence FDCGHOKNEA.	8	L3	CO3
OR				
4 a.	Define Binary search trees. Show with an example how the Indexed Binary trees formed.	7	L2	CO3
b.	Show how the object-oriented model implemented Co-sequential process.	8	L3	CO3
CO2 -Demonstrate the organization of fields and records in files CO3 -Show suitable sorting techniques to arrange the data and multi-level indexing and B-Tree techniques for organization of data in a file.				

Course Coordinator

Module Coordinator

Program Coordinator

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45

SAPTHAGIRI COLLEGE OF ENGINEERING
DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

SCHEME & SOLUTION

Semester: 6th A&B

Date: 31/5/2013

Staff Name: Prof. P. P. Kumar

Time: 9-10 am

INTERNAL TEST II

Subject: File Structures

Duration: 1 hr

Subject Code: 18IS61

Max Marks: 30

Signature: *[Signature]*

QS. No.	Solutions	Marks Allocated
1. a.	Binary Search is a searching technique where array is arranged in a sorted order.	2m
①	→ Fixed Record file methods → Ready - Relative Record No.	
	Algorithm: Steps to perform Binary Search for finding ordered Search	5m.
		<u>7m</u>
16)	Key Sort - Definition	1m
	Algorithm - Key Sort	4m
	Example - Sorting of Elements	3m
		<u>8m</u>
		1m
2a)	Definition of Indexing	
	Simple Index for entry Sequential files	$2\frac{1}{2} \times 2 = 5m$
	Selective Indexing & Binning	2m
	Example - for Indexing & Binning	<u>8m</u>
2b)	Indexing - A table containing a list of keys with reference field pointing to the Record	1m

Page No. 1

(Key, Reference) Pairs

→ Indexing provides Multiple access Paths.
→ Key access to Variable - Length Record file
Simple Index for variable Entry Sequence file.

1. Variable - Length Record

2. Primary key - Record Company

3. Simple Index with Key field with Reference field.

4. The Record access in order they Entered in file.

→ Examples

3a) 2-way Merge. Explanation with Example

4. A Selection tree for merging large no of lists with ex.

3b) Heap Sorting method for Insertion with Explanation

5. Build Heap of Heap Sort

2m

3m

1m

4m

3 1/2

1/2

7m

2m

2m

1m

Qs. No.	Solutions	Marks Allocated
	3b) <u>Contd</u> FDCG HOKNEA <u>Ans</u> <pre> graph TD A --> C A --> D C --> F C --> E D --> O D --> K F --> N F --> G E --> H </pre> LA C D F E O K N G H	3m
		<u>8m</u>
Aa)	Definition of Binary Search Tree	1m
	Indexed Binary Tree Structure	4m
	Example - BST	3m
		<u>7m</u>
Ad)	Object oriented Model for Co sequential process: Matching Names in Lists	1m
	Match operations (C++ prog)	6m
	Labeling & Synchronizing	7m
	Handling End of file Condition	
	Recognizing Errors	

26/6/2023
Page No.

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 (An ISO 9001:2015 & ISO 14001:2015 Certified)
DEPARTMENT OF ISE



Internal Assessment -I

Subject: IOT Technology and its application

Sub Code: 18CS81

Semester/Section: VIII A. & B

Max Marks: 30

Duration: 1 hour

Date: 17-03-2023

Note: Answer any two full questions, choosing one from each module

Question No.	Questions	Marks	BLT	CO's
Module-1				
1 a.	Demonstrate one M2M IoT standardized architecture and IOT (IOTWF) world standardized architecture	10	L3	CO1
b.	Compare IT and OT with different criterion.	5	L2	CO1
OR				
2 a.	Describe i) Access network sub layer, ii) IOT network management sub layer with neat diagram	8	L2	CO1
b.	Explain the following: Characteristic of fog computing model. Edge computing and fog computing with neat diagram	7	L2	CO1
Module-2				
3 a.	Classify different types of sensors and actuators. Explain how actuators and sensors interact with physical world.	8	L2	CO2
b.	Discuss the characteristics and attributes concerned when selecting and dealing with connecting smart objects.	7	L2	CO2
OR				
4 a.	Summarize and brief out the 802.15.4 and 802.15.4 physical layer, MAC layer and security.	9	L2	CO2
b.	Classify constrained devices and constrained node networks.	6	L2	CO2
CO1	Interpret the impact and challenges posed by IoT networks leading to new architectural models			
CO2	Compare and contrast the deployment of smart objects and the technologies to connect them to network.			

Sounya
 Course Coordinator

H.R. Ranganatha
 Module Coordinator

H.R. Ranganatha
 HOD
 Dr H.R. Ranganatha
 Prof. & H.O.D

Dept. of Information Science & Engg.
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 # 14/5, Chikkasandra, Hesaraghatta, Bengaluru - 560 057

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 14/5, Chikkasandra, Hesaraghatta, Bengaluru - 560 057

SAPTHAGIRI COLLEGE OF ENGINEERING
DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING
SCHEME & SOLUTION

Semester: VIII A&B

INTERNAL TEST I

Date: 17/3/23

Subject: IoT

Time: 9:00 - 10:30 AM

Duration: 1 hr

Staff Name: Sowmya Somareth

Subject Code: 18 CS21

Max Marks: 30

Signature: Sowmya

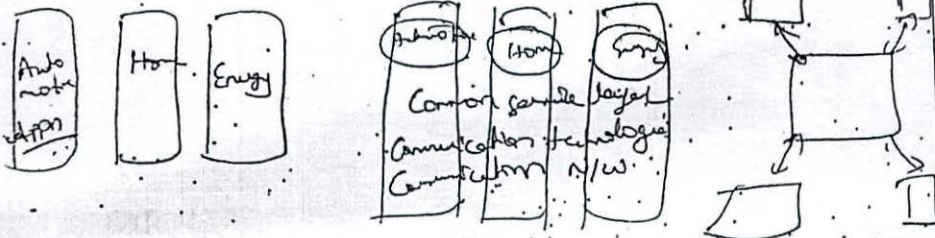
QS.
No.

Solutions

Marks
Allocated

1a)

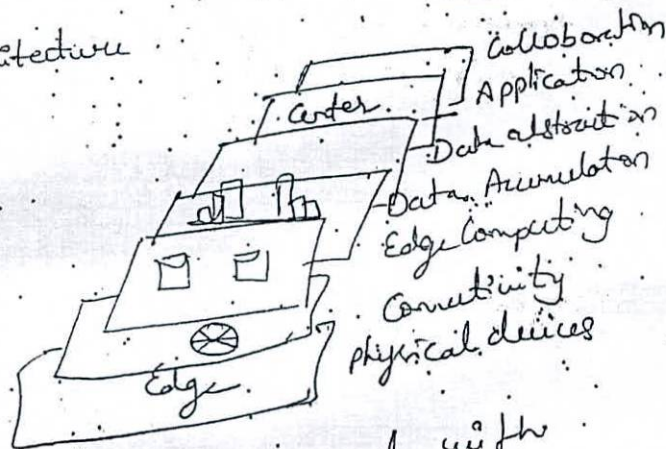
One H2M IoT Architecture



5M

1b)

IIOTWF Architecture



5M

b)

IT and OT are compared with respect to following operational focus

- priorities
- types of data
- security
- Implications of failure
- Network upgrade
- security vulnerability

Criteria - Industrial OT network	Enterprise IT Network
24x7	Manage data
Availability	→
integrity security	voice video
Monitoring control	Service level
physical access to devices	uses business impact
OT n/w disrupt	

5M

Page No. 1

Sowmya
Principal

Qs.
No.

Solutions

2a)

Access Network Sublayer

- Explanation

- PAN, HAN, NAN, FAN, LAN

i)

IoT n/w management sublayer with need diagram

- Explanation

- MQTT - Message queue telemetry transport protocol

- CoAP - Constrained application protocol

MQTT uses a broker-based architecture

TCP

b)

Characteristics of fog computing model
Contextual location awareness and low latency

Geographic distribution

Deployment near IoT endpoints

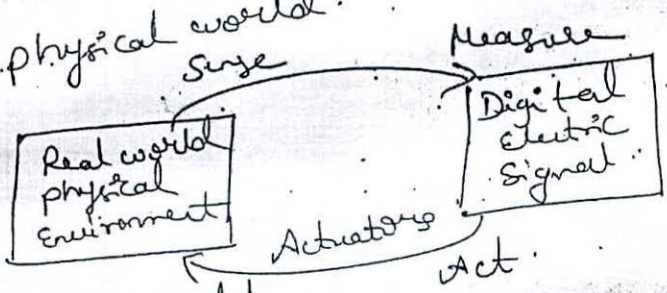
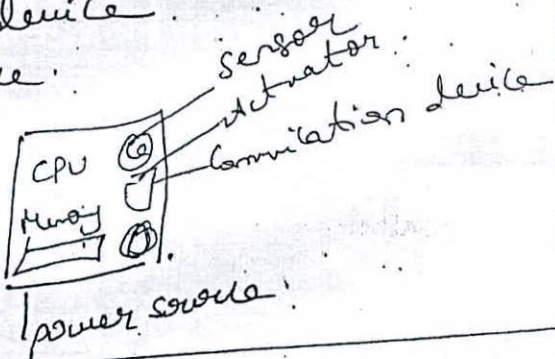
Wireless communication b/w fog & IoT Endpoint
use for real-time interactions

Edge Computing

Explanation

Fog Computing

Explanation with diagram

Qs. No.	Solutions	Marks Allocated
3a)	Different types of sensors and actuators position occupancy motion velocity acceleration force pressure Different types of actuators Mechanical actuators electrical actuators Electromechanical actuators Smart material Actuators & sensors interact with physical world. 	3M 3M 2M
b)	Characteristics and attributes when dealing with connecting smart objects. - processing unit - Sensor and actuator - Communication device - power source 	7M

B

Page No.

Qs. No.	Solutions	M. Allo																			
4a)	802.15.4 Physical layer. <table border="1"> <tr> <td>Preamble</td> <td>start of frame</td> <td>Length of frame</td> <td>PHY Service Data unit</td> </tr> </table> ← Synchronization header → MAC frame. <table border="1"> <tr> <td>Frame Control</td> <td>Seq no</td> <td>Dest P.I.D</td> <td>Dest Address</td> <td>Source Address</td> <td>Frame</td> <td>FCS</td> </tr> </table> Security <table border="1"> <tr> <td>Frame Control</td> <td>Seq no</td> <td>Dest P.I.D</td> <td>Dest Address</td> <td>Source P.I.D</td> <td>Source Address</td> <td>Frame</td> <td>FCS</td> </tr> </table>	Preamble	start of frame	Length of frame	PHY Service Data unit	Frame Control	Seq no	Dest P.I.D	Dest Address	Source Address	Frame	FCS	Frame Control	Seq no	Dest P.I.D	Dest Address	Source P.I.D	Source Address	Frame	FCS	4.5 M
Preamble	start of frame	Length of frame	PHY Service Data unit																		
Frame Control	Seq no	Dest P.I.D	Dest Address	Source Address	Frame	FCS															
Frame Control	Seq no	Dest P.I.D	Dest Address	Source P.I.D	Source Address	Frame	FCS														
b)	Constrained nodes & Constrained node networks - Class 0 — push button, sends 1 byte - Class 1 — Environmental sensors - Class 2 — power meter Constrained node networks characteristics * Data rate & throughput * Latency & determinism * Overhead & payload	3 M 3 M.																			



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Sapthagiri College of Engineering
Department of Mechanical Engineering
Internal Assessment – I, Even Sem (2022-2023)
Introduction to Mechanical Engineering

Semester: II sem(CS, IS)

Time: 1 hour

Max Marks: 25

Date: 12.07.2023

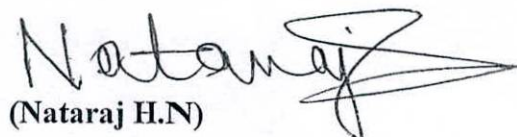
Note: - Answer any TWO full questions, choosing ONE full question from each module

Question No.	Questions	Marks	BLT	CO's
Module-1				
1 a.	Explain the role of Mechanical Engineering in Industries and Society.	06	L2	CO1
b.	Distinguish between renewable and non-renewable energy sources.	06	L2	CO1
OR				
2 a.	Describe the construction and working of Wind power plant with a schematic diagram.	07	L2	CO1
b.	Illustrate the operation of Liquid flat plate collector with neat sketch.	05	L2	CO1
Module-2				
3 a.	Define Lathe. Explain the following lathe operations with neat sketches. (i) Turning (ii) Facing (iii) Knurling	10	L1, L2	CO2
b.	Briefly explain 3-D printing	03	L2	CO2
OR				
4 a.	Describe the various components of CNC machine with neat sketch.	08	L2	CO2
b.	Explain the following drilling operations with neat sketches. (i) Reaming (ii) Boring	05	L2	CO2

CO1: Explain the concepts of Role of Mechanical Engineering and Energy sources.

CO2: Describe the Machine Tool Operations and advanced Manufacturing process.

Signature of the co-ordinator

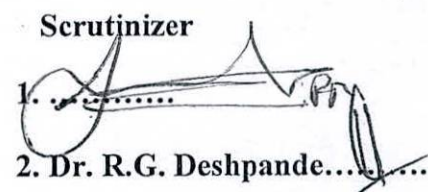

(Nataraj H.N)

Signature of HOD


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Bengaluru - 560 057

Scrutinizer


1.
2. Dr. R.G. Deshpande.....

SAPTHAGIRI COLLEGE OF ENGINEERING, BENGALURU-560057

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DEPARTMENT OF MECHANICAL ENGINEERING

SCHEME & SOLUTION

IA Test No: 1

Subject: Introduction to ME

Sub. Code: BESCK204D

Semester/Sec: II CS IS

Academic Year: 2022-2023

Question Number	Solution	Marks Allotted
1. a.	Role of Mechanical Engineering in Industries → (03)	06
b.	Society → (03)	
	Minimum 6 differences b/w Renewable & Non-renewable Energy sources → (03+03)	06
2. a.	wind power plant sketch → (03)	07
	construction → (02)	
b.	working → (02)	05
	Liquid flat plate collector sketch → (03)	
	operation → (02)	
3. a.	Definition of Lathe → (01)	10
	Lathe operations	
	(i) Turning → sketch → (02)	
	→ Expn → (01)	
	(ii) Facing → sketch → (02)	
	→ Expn → (01)	
	(iii) Knurling → sketch → (02)	03
	→ Expn → (01)	
b.	Definition of 3-D printing → (01)	
	Brief Description of 3D-printing → (02)	

Sapthagiri College of Engineering
Department of Mechanical Engineering
Internal Assessment – II, Even Sem (2022-2023)
Introduction to Mechanical Engineering

Semester: II sem (CS, IS)
Time: 1 hour

Max Marks: 25
Date: 18.08.2023

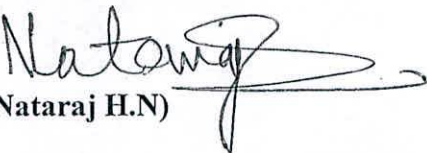
Note: - Answer any TWO full questions, choosing ONE full question from each module

Question	Questions	Marks	BLT	CO's
Module-3				
1 a.	Explain the working of 4- stroke Petrol engine with neat sketches.	08	L2	CO3
b.	List the advantages and limitations of Electric Vehicles.	04	L1	CO3
OR				
2 a.	Describe the components of Hybrid Electric Vehicles with neat block diagram.	08	L2	CO3
b.	Distinguish between four stroke Petrol engine and Diesel engine.	04	L2	CO3
Module-4				
3 a.	Describe the following materials. (i) Shape Memory Alloys (ii) Ceramics (iii) Polymers	09	L2	CO4
b.	Distinguish between Soldering and Brazing	04	L2	CO4
OR				
a.	Define Welding. Explain with neat sketch, working of Electric Arc Welding.	08	L1, L2	CO4
b.	Discuss the classifications of Engineering Materials.	05	L1, L2	CO4

CO3: Explain the Working Principle of IC engines and EV vehicles.

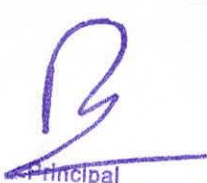
CO4: Discuss the Properties of Common Engineering Materials and various Metal Joining Processes.

Signature of the co-ordinator


(Nataraj H.N)

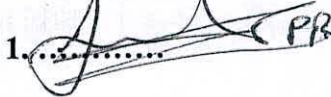
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Bengaluru - 560 057

Scrutinizer

1. 
2. Dr. R.G. Deshpande.....

SCHEME & SOLUTION

IA Test No: 2

Subject: Introduction to ME

Sub. Code: BESCK204D

Semester/Sec: II (C5 I5)

Academic Year: 2022-2023

Question Number	Solution	Marks Allotted
1. a.	Four Stroke Petrol Engine i) suction stroke ii) compression stroke iii) power stroke iv) Exhaust stroke. Sketch with working of each stroke (02+02+02+02)	08
b.	Electric vehicles Advantages → (02) Limitations → (02)	04
2. a.	Hybrid Electric Vehicles Block Diagram → (02) Explanation of components i) IC engine ii) Electric Motor iii) Batteries → (01x06) iv) Generator v) Converter vi) Transmission Unit	08
b.	Minimum 4 differences b/w Four Stroke Petrol & Diesel Engine → (02+02)	04

BESCK204D

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Sapthagiri College of Engineering
Department of Mechanical Engineering
Internal Assessment – III, Even Sem (2022-2023)
Introduction to Mechanical Engineering

Semester: II sem (CS, IS)
 Time: 1 hour

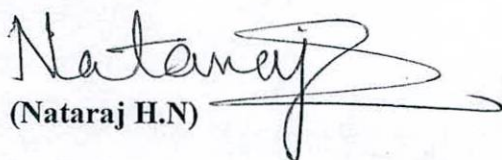
Max Marks: 25
 Date: 06.09.2023

Note: - Answer any TWO full questions, choosing ONE full question from each part

Question No.	Questions	Marks	BLT	CO's
Part-A				
1 a.	Define Mechatronics. Explain with neat sketch Closed loop mechatronics system.	06	L1, L2	CO5
b.	Describe with neat sketches, any two types of Robot Configurations.	06	L2	CO5
OR				
2 a.	Distinguish between Open loop and Closed loop Mechatronics System.	06	L2	CO5
b.	Explain the applications of Robots in the following domains of a manufacturing industry. (i) Material handling (ii) Processing (iii) Assembly and Inspection	06	L2	CO5
Part-B				
3 a.	Define Automation. Explain the three types of Automation.	07	L1, L2	CO5
b.	Define IoT. Briefly explain the characteristics of IoT.	06	L1, L2	CO5
OR				
4 a.	Describe the IoT functional Blocks with neat sketch.	08	L2	CO5
b.	Describe the basic elements of Automation system with block diagram.	05	L2	CO5

CO5: Explain the Concepts of Mechatronics, Robotics and Automation in IoT

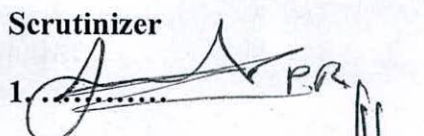
Signature of the co-ordinator


 (Nataraj H.N.)

Signature of HOD


 Principal
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 14/5, Chikkasandra, Hesaraghatta Main Road
 Bengaluru - 560 057

Scrutinizer

1. 
 2. Dr. R.G. Deshpande.....

SCHEME & SOLUTION

IA Test No: 3

Subject: Introduction to ME

Sub. Code: BE SCK204T

Semester/Sec: II (CS, IS)

Academic Year: 2022-2023

Question Number	Solution	Marks Allotted
1 a.	Definition of Mechatronics → (01) closed loop mechatronics system: sketch → (02) Explain → (03)	06
b.	Types of Robot configurations i) Cartesian Robot configuration ii) Cylindrical Robot configuration iii) Polar Robot configuration iv) Jointed arm Robot configuration → Description with sketch any two types of Robot configurations → (02+01+02+01)	06
2 a.	Minimum 6 differences b/w Open Loop & closed loop Mechatronics system. → (03+03)	06
b.	Applications of Robots i) Material Handling → (02) ii) Processing → (02) iii) Assembly & Inspection → (02)	06
3 a.	Definition of Automation → Three types of Automation → (04) i) Programmable Automation → (02) ii) Flexible Automation → (02) iii) Fixed Automation → (02)	07

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(Accredited by NAAC with "A" Grade) (Accredited by NBA for ECE, CSE, ISE, ME, EEE)

DEPARTMENT OF MECHANICAL ENGINEERING
Academic Audit: 2022-23 (Odd Semester)

COURSE FILE
Name of the Faculty:

Sl.No.	Documents	Status	Remarks
1.	Vision & Mission of the Institute		
2.	Vision & Mission of the Department		
3.	Subject Allotment Letter		
4.	Copies of Syllabus, List of text books, reference books, Course Objectives and Outcomes		
5.	Lecture Notes		
6.	University Question Papers		
7.	Calendar of Events (University, Institution)		
8.	Personal Time Table and Class Time Table		
9.	Lesson Plan & Teaching Diary		
10.	Student list and Batch List (for lab)		
11.	Attendance Register		
12.	Assignments / Question bank		
13.	I Test question paper with scheme and solutions		
14.	Test Absentee list -B Form		
15.	I IA and Assignment Marks :		
16.	Portion Covered (as on 31/01/2023)		

Overall Remarks:
*Low
s clear*
Faculty
Auditor
PRINCIPAL

SCHEME & SOLUTION

IA Test No: IA-1

Subject: Thermodynamics

Sub. Code: 21ME34

Semester/Sec: 3rd

Academic Year: 2022-23

Question Number	Solution	Marks Allotted
1. a)	(i) open system (ii) closed system (iii) Isolated system Definition } Examples } - 3x	4 Marks
b)	$R = R_0(1 + \alpha T + \beta T^2)$ At ice point - $R_0 = 10$ At steam point - $R = 16$ $0.6 = \alpha 100 + \beta 10000$ — (1) $1 = \alpha 444.6 + \beta (444.6)^2$ — (1) $\alpha = 7.088 \times 10^{-3}$ $\beta = -1.088 \times 10^{-5}$ — (1) $R = 18.24 \Omega$ — (2)	6 Marks
2. a)	Difference between microscopic & macroscopic approach	4 Marks
b)	$p = e^{(t-B)/A}$ $A \ln 1.86 + B = 0$ — (1) — (1) $A \ln 6.81 + B = 100$ — (1) — (1) $A = 77.05, B = -47.8$ — (1) $p = e^{(t-47.8)/77.05}$ — (1) $t = 22.8^\circ \text{C}$ — (2)	6 Marks

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Department of Mechanical Engineering (NBA Accredited)

Internal Assessment Test-II for the AY: 2022-23 (Odd Sem)

Basic ThermodynamicsSem/Sec: 3rd
Time: 60 MinMax. Marks: 20
Date: 1/4/2023

Q.No	<i>Note: Answer the following questions</i>	RBT Level	Cos
Module-3			
1. a)	Explain with a neat sketch PMMK-1 and PMMK-2.	L2	CO1
b)	A reversible engine operates between T_1 and T . the the energy rejected by this engine is received by second reversible engine and heat is rejected to sink T_2 . Show that for same efficiency T is geometric mean of T_1 and T_2 .	L3	CO1
OR			
2. a)	Show that Equivalence of Kelvin Planck statement to the clausius statement.	L2	CO1
b)	A domestic food refrigerator maintains a temperature of -10°C , the ambient air temperature is 30°C . The heat leakage into the freezer is estimated to be at the continuous rate of 2kJ/Sec . Determine the least power needed to pump out this continuously.	L3	CO1
Module-4			
3. a)	Briefly explain the following, (i) Mass Fraction (ii) Mole Fraction (iii) Dalton's law	L2	CO1
b)	A vessel Contains 10 Kg of O_2 , 5 kg of N_2 , and 20 kg of CO_2 . the total pressure in the vessel is 600 Kpa. The temperature is 80°C . Calculate (i) Partial Pressure of each gas in the vessel. (ii) Volume of the vessel	L3	CO1
4 a)	With neat sketch of compressibility chart explain compressibility factor and reduced parameters.	L3	CO1
b)	A mixture of gases contains 2 Kg of CO_2 and 2.5 Kg of N_2 . The pressure and temperature of the mixture are 2.5 bar and 27°C . Determine (i) Mass and Mole fraction of each constituent gas (ii) Average Molecular weight. (iii) Specific gas constant.	L3	CO1



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SCHEME & SOLUTION

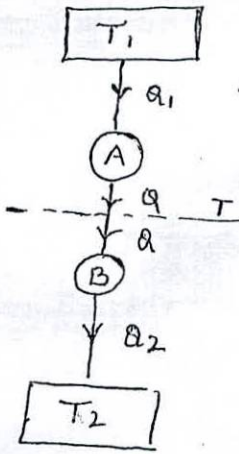
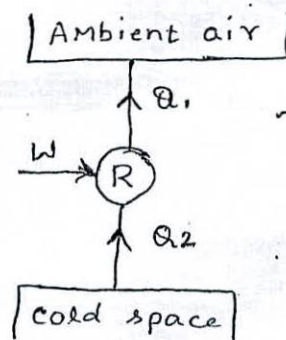
IA Test No: IA-2

Subject: Thermodynamics

Sub. Code: 21ME34

Semester/Sec: 3rd

Academic Year: 2022-23

Question Number	Solution	Marks Allotted
1. a)	Explanation of PMMK-1 & PMMK-2 2X3 =	6 marks
b)	 $2A = 2B \rightarrow (1)$ $\frac{T_1 - T}{T_1} = \frac{T - T_2}{T} \rightarrow (2)$ $T = \sqrt{T_1 T_2} \rightarrow (2)$ $W_A = W_B \rightarrow (1)$ $\left(\frac{T_1 - T}{T_1}\right) Q_1 = \left(\frac{T - T_2}{T}\right) Q \rightarrow (2)$ $T = \frac{T_1 + T_2}{2} \rightarrow (2)$	10 marks
2. a)	Equivalence of Kelvin-planck statement to the Clausius statement.	6 marks
b)	 $COP = \frac{T_2}{T_1 - T_2} = \frac{Q_2}{Q_1 - Q_2} \rightarrow (2)$ $Q_1 = 2.304 \text{ kJ/sec} \rightarrow (3)$ $W = Q_1 - Q_2 \rightarrow (1)$ $W = 0.304 \text{ kJ/sec} \rightarrow (2)$	10 marks

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Department of Mechanical Engineering (NBA Accredited)

Internal Assessment Test-III for the AY: 2022-23 (Odd Sem)

ThermodynamicsSem/Sec: 3rd

Time: 60Min

Max. Marks: 20

Date: 29/2/2023

Q.No	<u>Note: Answer the following questions</u>	RBT Level	Cos
	Module-4		
1. a)	Explain briefly critical point with T-v diagram and triple point with P-T diagram. (4 Marks)	L2	CO4
b)	Calculate the internal energy per kg of superheated steam at a pressure of 10 bars and a temperature of 300° C. Also find the change of internal energy if this steam is expanded to 1.4 bar and dryness fraction 0.8. (6 Marks)	L3	CO4
	OR		
2. a)	With a neat sketch explain measurement of dryness fraction using Throttling calorimeter. (4 Marks)	L2	CO4
b)	A pressure cooker contains 1.5 kg of saturated steam at 5 bar find the quantity of heat which must be rejected so as to reduce quality to 60 % dry. Determine the pressure and temperature at new state. (6 Marks)	L3	CO4
	Module-1		
3. a)	With P-V and T-S diagram Derive the Air Standard efficiency and mean effective pressure of Diesel Cycle. (10 Marks)	L3	CO5
	OR		
4 a)	The Minimum pressure and temperature in an Otto Cycle are 1000 Kpa and 27° C . The amount of heat added to air per cycle is 1500 KJ/Kg. Determine (a) The pressure and temperature at all points (b) Air Standard efficiency for a compression Ratio 8. Take for air $C_v = 0.72$ KJ/Kg. (10 Marks)	L3	CO5

At the end of this course the students will be able to

CO4: Compute available energy in thermodynamic systems and Pure substances utilization.

CO5: Evaluate the thermal efficiency of Gas and Vapour Cycle.


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SCHEME & SOLUTION

IA Test No: IA-3

Subject: Thermodynamics

Sub. Code: 21ME34

Semester/Sec: 3rd

Academic Year: 2022-23

Question Number	Solution	Marks Allotted
1 a>	critical point and Triple point Diagram - ① Explanation - ① } - 2x2 -	4 marks
b>	$u_1 = h_{sup} - 100 P_1 v_1$ $u_1 = 2806.2 \text{ KJ/kg}$ — ② $u_2 = h_g - 100 P_2 v_2$ $u_2 = 2105.42 \text{ KJ/kg}$ — ② $v_2 = x \cdot v_{g2}$ — ① $\therefore u_2 - u_1 = -700 \text{ KJ/kg}$ — ①	6 marks
2 a>	Throttling calorimeter Sketch - ② Explanation - ②	4 marks
b>	$M_1 = 0.5619 \text{ m}^3$ $u_1 = h_1 - 100 P_1 v_1 = 2560.17 \text{ KJ/kg}$ — ① $v_1 = v_2 = M \cdot v_2$ $v_{g2} = 0.6244 \text{ m}^3/\text{kg}$ — ① $P = 2.9164 \text{ bar}$ — ② $u_2 = h_2 - 100 P_2 v_2 = 1747.19 \text{ KJ/kg}$ — ① $Q = u_2 - u_1 = -812.97 \text{ KJ/kg}$ — ①	6 marks

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Department of Mechanical Engineering

Internal Assessment Test-1 AY: 2022-23 (ODD SEM)

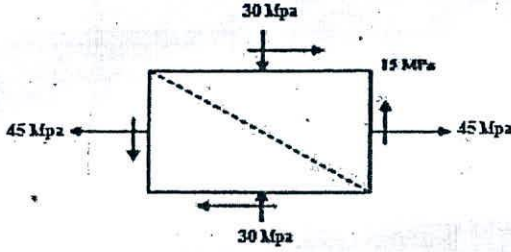
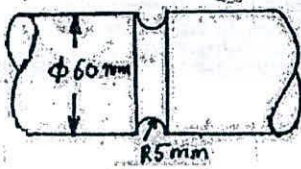
DESIGN OF MACHINE ELEMENTS-1

Sem/Sec: 5th A

Time: 90Min

Max. Marks: 30

Date: 14-11-2022

Q.No	Note: Answer the following questions	RBT Level	COs
1 (a)	Explain the general procedure used in design. [7 Marks]	L2	CO1
(b)	A point in a structural member is subjected to plane stress as shown in the Figure 1. Determine the following i) Normal and tangential stress intensities on a plane MN Inclined at an angle of 45°. ii) Principal stress and their direction. [8 Marks]  Figure 1 OR	L3	CO1
2(a)	Explain design codes and standards used for designing machine element. [7 Marks]	L2	CO1
(b)	A shaft of 50mm diameter and 300mm length, fixed at one end is subjected to a torsional load of 3KN-m in addition to a bending load of 5KN. Determine the stresses at critical points. [8 Marks]	L3	CO1
3(a)	A round rod of diameter 40mm is to sustain an axial compressive load of 25KN and a twisting moment of 10KNm. The rod is made of C40 Steel ($\sigma_{yt}=300\text{Mpa}$). Determine FOS, as per following theories of Failure 1) Max. Principal Stress Theory 2) Max. Elastic Strain Energy Theory 3) Distortion Energy Theory [10 Marks]	L3	CO1
(b)	Define Factor of Safety and list the factors influencing factor of safety. [5 Marks] OR	L1	CO1
4(a)	Determine the maximum stress induced in the semicircular grooved shaft shown in the Figure 2 below if it is subjected to a) An axial load of 40KN b) Bending moment of 400N-m  Figure 2 [6 Marks]	L3	CO1
(b)	A shaft of 50mm diameter is stepped down to 40mm with a fillet radius of 5mm. If the allowable shear stress is 50N/mm^2. Determine the power that can be transmitted at 1200 rpm considering stress concentration into account. [9 Marks]	L3	CO1

At the end of this course the students will be able to

CO1: Describe and apply various codes and standards in design process and analyze the behavior of machine elements subjected to static loading

Signature of Course Coordinator: *CRAM KUMAR. M*

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Scrutinized by:

1. Chethan B P:

2. Pramod S V:

3. Dr. R. G. Deshpande:

Question Number	Solution	Marks Allotted
	At point B, $\sigma_1 = 61.26 \text{ N/mm}^2$ $\sigma_2 = -181.49 \text{ N/mm}^2$ } 03 $\tau_{\max} = 122.38 \text{ N/mm}^2$	
3(a)	$\sigma_x = F/A = 19.89 \text{ N/mm}^2$ $\tau = \frac{M_t \cdot r}{J} = \frac{10 \times 10^6 \times 20}{\frac{\pi \times 40^4}{32}} = 795.77 \text{ N/mm}^2$ — 02 Max. principal stress. $\sigma_1 = \frac{\sigma_x}{2} + \sqrt{\left(\frac{\sigma_x}{2}\right)^2 + \tau^2} = 805.77 = \frac{300}{\text{FOS}} \Rightarrow \text{FOS} = 0.372$ } 02 $\sigma_2 = \frac{\sigma_x}{2} - \sqrt{\left(\frac{\sigma_x}{2}\right)^2 + \tau^2} = -785.88 \text{ N/mm}^2$ ① Max Principal stress theory = FOS = 0.372 — 02 ② Max. Elastic Strain Energy Theory $\left(\frac{\sigma_{yt}}{\text{FOS}}\right)^2 = \sigma_1^2 + \sigma_2^2 - 2\sigma_1\sigma_2$ FOS = 0.233 — 02 ③ Distortion Energy Theory $\left(\frac{\sigma_{yt}}{\text{FOS}}\right)^2 = \sigma_1^2 + \sigma_2^2 - \sigma_1\sigma_2$ FOS = 0.27 — 02	10
(b)	Ratio of max. stress to working stress Factors: Material properties, application, time & environment wear rate, life, reliability, heat treatment, human safety } 04	05
4(a)	For tensile load $d = D - 2r = 50 \text{ mm}$, $r/d = 5/50 = 0.1$ $D/d = 1.2$ From graph 4.14A, $K_t = 2.5$ $K_f = \frac{\sigma_{\max}}{\sigma_{\text{nom}}}$ $\sigma_{\text{nom}} = \frac{F}{A} = 14.15 \text{ N/mm}^2$ $\sigma_{\max} = 30.42 \text{ N/mm}^2$ — 03 For bending load, $r/d = 0.1$ & $D/d = 1.2$ From graph, 4.16 $K_t = 1.85$ $K_f = \frac{\sigma_{\max}}{\sigma_{\text{nom}}}$ $\sigma_{\text{nom}} = \frac{M_b C}{I} = 18.87 \text{ N/mm}^2$ $\sigma_{\max} = K_t \sigma_{\text{nom}} = 32.07 \text{ N/mm}^2$ — 03	06
(b)	From graph in DDHB, fig 4.19A $r/d = 5/40 = 0.125$ $D/d = 50/40 = 1.25$ — 01 - $K_t = 1.3$ $K_t = \frac{\tau_{\max}}{\tau_{\text{nom}}}$ $\tau_{\text{nom}} = \frac{50}{1.3} = 38.46 \text{ N/mm}^2$ — 03 $\tau_{\text{nom}} = \frac{M_t \cdot C}{J}$ — 01 $38.46 = \frac{M_t \cdot 20}{\frac{\pi \times 40^4}{32}}$ $M_t = 488.3 \text{ N-m}$ — 02 Power $P = \frac{2\pi NT}{60,000} \text{ kW} \rightarrow P = 60.73 \text{ kW}$ — 02	09

Signature of the Faculty: Ram

Name: Ram Kumar. M.

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Internal Assessment Test-3 for the AY: 2022-23(Odd SEM)

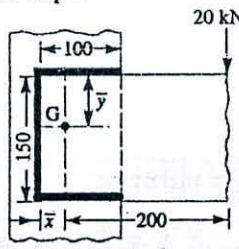
DESIGN OF MACHINE ELEMENTS-1

Sem/Sec: 5th A

Time: 60Min

Max. Marks: 30

Date: 17-01-2023

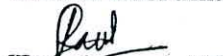
Q.No	<i>Note: Answer the following questions</i>	RBT Level	COs
1(a)	A rectangular sunk key 14mm wide and 10mm thick and 75mm long is required to transmit 1500N-m torque from a 50mm diameter solid shaft. Determine whether the length of the key is sufficient or not if the permissible shear stress and crushing stress are limited to 56Mpa and 160Mpa respectively. [5 Marks]	L3	CO3
(b)	Design a protected type cast iron flange coupling for a steel shaft transmitting 30KW at 200rpm. The allowable shear stress in the bolt is 60MPa and allowable shear stress in flange is 40MPa. [10 Marks]	L3	CO3
	OR		
2.	Design a pin type flexible coupling for Star Company to transmit 10kW power at 400 rpm. Assume C40 steel as shaft, pin and key material $\sigma_{yt}=328.6\text{Mpa}$ and C.I as flange and hub material $\sigma_{ut}=124.5\text{Mpa}$ [15Marks]	L3	CO3
3.	For a Hindustan Shipbuilders, a steel plate has to be welded to an eccentric load of 20 kN as shown in the Fig. 1. The welding is only on one side. Determine the uniform size of the weld on the entire length of two legs. Take permissible shear stress for the weld material as 80 Mpa. [15Marks]	L3	CO4
	 All dimensions in mm. Figure 1		
	OR		
4(a)	List the advantages of welded joints over riveted joints. [5Marks]	L1	CO4
(b)	A plate of 80mm wide and 15mm thick is joined with another plate by a single transverse weld and double parallel weld. Determine the length of the parallel fillet weld if the joint is subjected to both static and fatigue loading. Take allowable tensile and shear stress as 90Mpa and 55Mpa respectively and stress concentration factor as 1.5 for transverse and 2.7 for parallel weld. [10Marks]	L3	CO4

At the end of this course the students will be able to

CO3: Design shafts, keys and couplings for power transmission.

CO4: Design permanent joints.

Course Coordinator:


[Ram Kumar M]

Scrutinized by:

1. Dr.R.G.Deshpande:

2. Pramod. S.V: 


Principal


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SCHEME & SOLUTION

IA Test No: III

Subject: Design of Machine Elements - I

Sub. Code: 18ME52

Semester/Sec: 5th

Academic Year: 2022-23

Question Number	Solution	Marks Allotted
1 a)	$P = \frac{2\pi NT}{60,000} \text{ kW} \quad \phi = 75 \text{ mm} \quad M_t = 1500 \text{ N-m} = 1500 \times 10^3 \text{ N-mm} \quad -9$ $b = \frac{2M_t}{\tau_{ld}} \quad \tau = \frac{2M_t}{\pi d^3} = 57.14 > 56 \text{ MPa} \quad \left. \begin{array}{l} \text{length to be increased} \\ = 0.2 \times 2 \text{ M} \end{array} \right\}$ $h = \frac{4M_t}{\sigma_{ld}} \quad \sigma_c = 114.28 < 160 \text{ MPa}$	= 05
b)	Step 1: $P = \frac{2\pi NT}{60,000}$ $M_t = 1433121.019$ $M_{t \max} = 1.2 M_t = 1719745.22 \text{ N-mm}$ — 1 Step 2: $M_{t \max} = \frac{\pi}{16} d^3 \tau_{s\eta}$ $d = 66.35 \approx 70 \text{ mm}$ — 1 Step 3: Bolt circle dia $D_1 = 2d_1 + 50 = 190 \text{ mm}$ — 1 Step 4: Check for hub $D_2 = 1.5d + 25 = 130$ $l = 1.25d + 18.75 = 106.25$ — 1 Steps: Flange $D = 2.5d_1 + 85 = 260 \text{ mm}$ $D_3 = 2.5d + 75 = 250 \text{ mm}$ — 2 $l = 0.5d_1 = 35 \text{ mm}$ $l_1 = 0.25d_1 = 17.5 \text{ mm}$ check for Flange $M_{t \max} = \frac{\pi}{16} D^3 \tau_f (D_2/2) = 1.851 < 40 \text{ N/mm}^2$ Step 6: No. of bolts $i = 0.02d + 3$ $i = 6$ $M_t = \frac{\pi}{4} d^3 \tau_{ld} \frac{D_1}{2}$ — 2 $d_1 = 7.3 \text{ mm}$ $M_{t \max} = \frac{\pi}{16} d^3 \tau_c (D_1/2)$ $\sigma_c = 9.8 < 120 \text{ N/mm}^2$ Step 7: Design of key for $d = 70 \text{ mm}$ $b = 20$ $h = 12$ — 2 $l = 110 > 107$ $\tau = 22.32 < 40 \text{ MPa}$ $\sigma_c = 74.41 < 80 \text{ MPa}$	10
2.	Torque transmitted by coupling $M_t = 238782.4 \text{ N-mm}$ — 1 Dia of shaft $M_t = \frac{\pi}{16} d^3 \tau_{s\eta}$ $d = 27.02 \approx 30 \text{ mm}$ — 1 No. of bolts or pins $i = 0.02d + 3 = 6$ Design of hub $D_2 = 2d = 60$ Dia of hub (Nut side) = 52.55 mm Length of hub (pin side) = 41.25 mm $l = (\text{Nut side}) = 1$ Bolt circle dia $D_1 = 2d + 50 = 110 \text{ mm}$ Length of rubber bush $l = 0.625d = 18.75 \text{ mm}$ Outer dia of rubber bush $= M_t - i F (D_1/2) = F = 578.8 \text{ N}$ $d = 32 \text{ mm}$ Check for dia $= D_1 = D_2 + d$ (Clearance x 2) Dia of pin $d = d_2 + 2(\text{thickness of brass bush} + \text{thickness of rubber bush})$ — 1 $d_2 = 15 \text{ mm}$ $d_1 = 10 \text{ mm}$ $d_p = 10 \text{ mm}$ Check for pin $\tau_p = F / 0.785 d_p^2 = 7.4 \text{ N/mm}^2$ — 1	15

Question Number	Solution	Marks Allotted
	$\tau = \frac{F}{\pi/32 d p^3} \rightarrow b = 0.1d \cdot \tau_{max} = 37.2 < 82 N$ $\tau_{max} = 37.2 < 82 N$ Design of key & check for safety $b = 8, h = 7, l = 45 mm$ - 2 Design of Flange $D = 160, t = 1.875$ Total thickness = 22.5 - 2 Safety of Flange $\tau < 15.56 N/mm^2$ - 1	
3.	Step 1: Find C_g $C_x = \frac{d^2}{2(b+d)} = 45 mm, C_y = \frac{b^2}{2(b+d)} = 20 mm$ - 2 Step 2: $z = b \cdot C_y = 80 mm, y = C_x = 45 mm$ $r = \sqrt{z^2 + y^2} = 91.78 mm, \cos \theta = \frac{z}{r} = 0.8716, e = 200 mm$ - 3 Step 3: $P_1 = P_2 = 80 N/mm^2, l = 250 mm$ - 2 Step 4: $P_0 = \frac{P \cdot e \cdot r}{J}, J = J_0 = \frac{(b+d)^4 - 6b^2d^2}{12(b+d)}$ - 2 $P_0 = 502.10 N/mm$ - 2 Step 5: $t = \frac{P_0}{0.707 w l} = 80, l = 1, w = 8.8 \approx 9 mm$ - 2	15
4(a)	Lighter in wt due to elimination of straps. plates, cover plates Higher efficiency > 100%, leakproof, less noise, ease of fabrication, less cost, Drilling increases stress concentration can bear more load	05
4(b)	Static loading: Max Tensile load = $b h \tau_b = 108000 N$ - 2 $P = 0.707 w l n \sigma + 0.707 w l p t, l_n = 80 mm$ $l_p = 54.25 mm, l_t = l_p + 5i = 54.25 + 5 \times 2 = 64.25 mm$ Effective length of each parallel weld = $l_p = 27.125 mm$ Total length of each parallel weld = $l_{t/2} = 32.125 mm$ } 3 Fatigue loading $\tau = \frac{20.37}{2.5} = 8.148, \sigma = \frac{90}{1.5} = 60 N/mm^2$ $P = 0.707 w l n \sigma + 0.707 w l p t, l_p = 264.3 mm$ $l_n = 80 mm$ $l_t = l_p + 5i = 274.3 mm, l_{t/2} = 132.15 mm$ $l_{t/2} = 137.15 mm$ } - 2	10

Signature of the Faculty: Ravi

Name: RANKOMAR. M

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Internal Assessment Test-2 for the AY: 2022-23 (Odd Sem)

DESIGN OF MACHINE ELEMENTS-1Sem/Sec: 5th A

Time: 60Min

Max. Marks: 30

Date: 19/12/2021

Q.No	Note: Answer the following questions	RBT Level	COs
1(a)	Derive Soderberg's equation for ductile material. [6 Marks]	L3	CO2
(b)	An unknown weight falls through 10mm on a collar rigidly attached to the lower end of a vertical bar 3m long and 600mm ² cross-section. The maximum instantaneous extension is 2mm. Analyze the corresponding stresses and the value of the unknown weight. Take E=206Gpa. [9 Marks]	L4	CO2
	OR		
2(a)	Derive stress equation for axial impact of bar. [6 Marks]	L3	CO2
(b)	A hot rolled steel rod is subjected to a torsional load that varies from +330 Nm clockwise to -110 Nm counter clockwise and an applied bending moment varies from +440 Nm to -220 Nm. The rod is uniform cross-section. The material has an ultimate tensile strength of 550Mpa, yield strength of 410Mpa. Design based on a factor of safety of 1.5. Take endurance limit as half the ultimate strength. Find and analyze the rod diameter for maximum stress values of fatigue. [9Marks]	L4	CO2
3(a)	Design and sketch a Knuckle joint to connect two mild steel rods to sustain an axial pull of 150KN. The pin and the rods are made of same material. The working stresses in the material as 80 Mpa in tension, 40Mpa in shear and 120Mpa in crushing. [15Marks]	L3	CO5
	OR		
4(a)	Explain self-locking and overhauling in power screws. [5Marks]	L3	CO5
(b)	The jaws of a machine vice weigh 5000 N and slid by two start acme thread 50mm diameter and 8mm pitch at a speed of 800mm/min. The ends of the screw carried a thrust washer of mean diameter 56mm. The coefficient of thread friction is 0.14. Determine the power of the motor required in kW and efficiency of the drive. [10Marks]	L3	CO5

At the end of this course the students will be able to

CO2: Analyze the behavior of machine elements subjected to impact and fatigue loading

CO5: Design temporary joints and power screws.

Course Coordinator:


 [Ram Kumar M]

Scrutinized by:

1. Dr.R.G.Deshpande:

2. Pramod S.V:

HOD

Principal

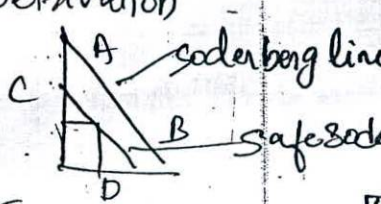
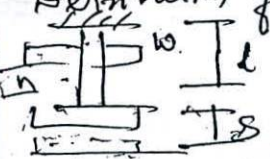
 Sapthagiri College of Engineering
 14/5, Chikkasandra, Hesarghatta Main Road
 Bengaluru - 560 057

Scheme and Solution

Sub Name: DME-1

Code: 18MES2 Class and Section: 5th A

Date: 19/12/2022

Question Number	Solution	Marks Allocated
1 a)	Soderberg's Derivation Diagram  Derivation $\frac{PE}{OC} = \frac{ED}{OD} = 1 - \frac{OE}{OD} = 1 - \frac{\sigma_m}{(\sigma_y/n)}$ $\frac{\sigma_x}{(\sigma_y/n)} = 1 - \frac{\sigma_m}{(\sigma_y/n)} \cdot \left[\frac{K\sigma_x + \sigma_m}{\sigma_x} + \frac{\sigma_m}{\sigma_y} = 1 \right]$ 02 06	
b)	$h = 10\text{mm}$ $l = 300\text{mm}$ $A = 600\text{mm}^2$ $S^1 = 2\text{mm}$ $E = 206\text{GPa} = 206 \times 10^3 \text{N/mm}^2$ $\sigma_{\max} = \sigma_{st} \left(1 + \sqrt{1 + \frac{2h}{\delta_{st}}} \right)$ where $\delta_{st} = \frac{WL}{AE}$ -3 $W = 6866.6\text{N}$ $\sigma_{st} = W/A = 11.44\text{N/mm}^2$ -3 09	
2 a)	Derivation of Axial Impact of bars  $W = 10(h + \delta)$ $\frac{1}{2} W \delta = W(h + \delta)$ $P = \sigma A$ $\delta = \frac{\sigma l}{E}$ Assuming at $\sigma = \frac{W}{A} \left[1 + \sqrt{1 + \frac{2hEA}{WL}} \right]$ $\sigma_1 = \sigma_{st} \left[1 + \sqrt{1 + \frac{2hEA}{WL}} \right]$ -3 06	
b)	$M_{t\max} = 83 \times 10^4 \text{N-mm}$ $M_{t\min} = -11 \times 10^4 \text{N-mm}$ $M_{b\max} = +440 \text{N-m}$ $M_{b\min} = -22 \times 10^4 \text{N-mm}$ <u>Torsion</u> $T_{\max} = \frac{M_{t\max} \gamma}{J} = \frac{1.68 \times 10^6}{d^3}$ $T_{\min} = -\frac{5.6 \times 10^5}{d^3}$ -1 $T_a = \frac{112 \times 10^4}{d^3}$ $T_m = \frac{56.023 \times 10^4}{d^3}$ $T_{1d} = 57.97 \text{N/mm}^2$ $T_{yd} = 164 \text{N/mm}^2$ $T_{eq} = \frac{373 \times 10^4}{d^3}$ -1 3m	

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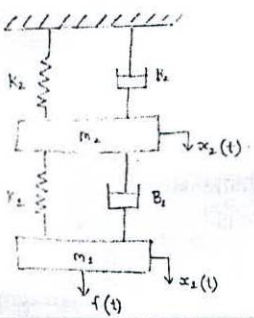
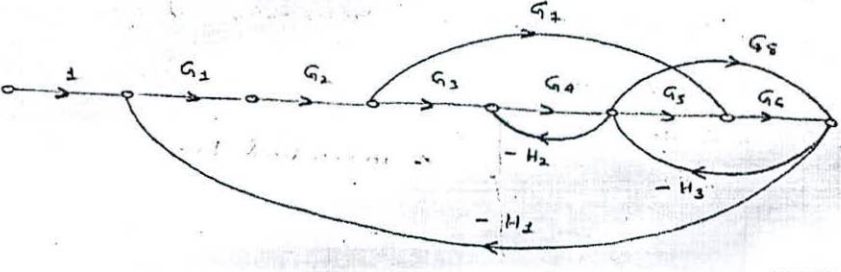
Department of Mechanical Engineering (NBA Accredited)

Internal Assessment Test -1 for the AY: 2022-23(ODD Sem.)

CONTROL ENGINEERING

Sem/Sec: VII A & B

Max. Marks: 30

Q. No	Note: Answer the following questions	RBT Level	COs
PART-A			
1(a)	Explain the ideal requirement of Control system and distinguish between Open loop & Closed loop control system. (07 Marks)	L2	CO1
(b)	Discuss and state the characteristics of the Proportional, Integral and PD controller. (08 Marks)	L2	CO1
OR			
2(a)	Derive the Transfer function of Armature Controlled DC Motor. (09 Marks)	L2	CO2
(b)	Explain with neat sketch any one Automatic control system. (06 Marks)	L2	CO1
PART-B			
3(a)	 Obtain the differential equation of equilibrium for the mechanical system shown in fig and draw the equivalent mechanical system, also draw the analogous electrical network based on i) Force-voltage analogy ii) Force-Current analogy. (09 Marks)	L3	CO2
(b)	Discuss the terms used in Signal Flow Graph and also list its properties. (06 Marks)	L1,L2	CO4
OR			
4(a)	Explain Mason's gain formula and find the overall transfer function for the system shown in fig. using Mason's gain formula. (09 Marks) 	L3	CO4
(b)	Explain with neat sketch of the Mechanical and Hydraulic model systems. (06 Marks)	L2	CO2

At the end of this course the students will be able to

CO1: Describe the Basic Principles of control system and controllers.

CO2: Determine the system governing equations for physical models of mechanical, electrical thermal and hydraulic system.

CO4: Determine the transfer function of a control system using Block diagram reduction technique and Signal flow graphs.

Signature of Course Co-ordinator

HOD

Professor & Head
Department of Mechanical Engineering
Sapthagiri College of Engineering
Bengaluru - 560 057.

Scrutinized by

1. Dr. R. G. Deshpande

2. C. Chetan

Principal

Sapthagiri College of Engineering
14/5, Chikkasandra, Hesaraghatta Main Road
Bengaluru - 560 057

SCHEME & SOLUTION

IA Test No: I

Subject: Control Engineering

Sub. Code: 18ME71

Semester/Sec: VII / A, B

Academic Year: 2022-23

Question Number	Solution	Marks Allotted
1a	→ Ideal requirement of control system → Distinguish between open loop & closed loop control system	<u>4m</u> <u>3m</u>
b	→ characteristics of the proportional —— " ——— " ——— Integral —— " ——— " ——— PD controller	<u>2m</u> <u>3m</u> <u>3m</u>
2a	OR Transfer function of Armature controlled DC motor	<u>9m</u>
b	→ sketch of Automatic control system → Explanation of ——— " ———	<u>2m</u> <u>4m</u>

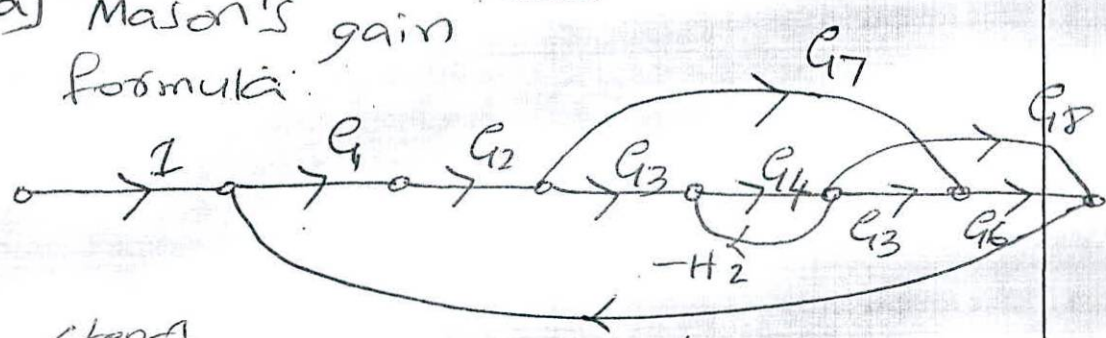
(Signature)

CONTD... SCHEME & SOLUTION

IA Test No: I

Subject: _____ Sub. Code: _____

Semester/Sec: _____ Academic Year: _____

Question Number	Solution	Marks Allotted
4	a) Mason's gain formula <u>OR</u>  Step-1 → $P_1 = G_1 G_2 G_3 G_4 G_5 G_6$ $P_2 = G_1 G_2 G_7 G_8$ $P_3 = G_1 G_2 G_3 G_4 G_8$ Step-2 → $L_1 = -G_4 H_2$ $L_2 = -G_5 G_6 H_3$ $L_3 = -G_1 G_2 G_3 G_4 G_5 G_6 H_1$ $L_4 = -G_8 H_3$ $L_5 = -G_1 G_2 G_3 G_4 G_8 H_1$ $L_6 = -G_1 G_2 G_7 G_8 H_1$ Step-3 → $L_1 L_6 = G_1 G_2 G_4 G_6 G_7 H_1 H_2$	2M 3M

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Department of Mechanical Engineering (NBA Accredited)**Internal Assessment Test -II for the AY: 2022-23(ODD Sem.)****CONTROL ENGINEERING**

Sem/Sec: VII A & B

Max. Marks: 30

Q. No	Note: Answer the following questions	RBT Level	COs
PART-A			
1(a)	The response of a system subjected to a unit step input is $C(t) = 1 + 0.2e^{-60t} - 1.2e^{-10t}$. Obtain the expression for the closed loop transfer function. Also determine the undamped natural frequency and damping ratio of the system. (8 Marks)	L2	CO3
(b)	Derive the standard form of transient response: Second order system. (7 Marks)	L2	CO3
OR			
2(a)	A unity feedback system is characterized by an open loop transfer function $G(S)H(S) = \frac{10}{s^2 + 2s + 6}$. Determine the following when the system is subjected to a unit step input i) Undamped natural frequency. ii) Damping ratio. iii) Peak Overshoot. iv) Peak time. v) Settling time (8 Marks)	L2	CO3
(b)	Summarize the steady-state errors of Type-2 unity feedback system. (7 Marks)	L2	CO3
PART-B			
3(a)	Reduce the given block diagram shown in fig. and obtain the transfer function of the system. (12 Marks) 	L3	CO4
(b)	Explain the parts of Time Response. (3 Marks)	L2	CO3
OR			
4(a)	Obtain the overall transfer function of the block diagram shown in fig. by reduction technique. (12 Marks) 	L3	CO4
(b)	Explain the parts of Standard Test Inputs Signals. (Any 3) (3 Marks)	L2	CO3

At the end of this course the students will be able to

CO3: Illustrate the response of 1st and 2nd order systems.

CO4: Determine the transfer function of a control system using Block diagram reduction technique and

Signal flow graphs.

Signature of Course Co-ordinator

HOD

Scrutinized by

1. Dr. R. G. Deshpande
2. (Chetan)

Professor & Head

Department of Mechanical Engineering

Sapthagiri College of Engineering

Bengaluru - 560 057.

Principal

Sapthagiri College of Engineering
14/5, Chikkasandra, Hosuraghatta Main Road
Bengaluru - 560 057

I Steel

SCHEME & SOLUTION

IA Test No: II

Subject: Control Engineering

Sub. Code: 18ME71

Semester/Sec: VII/A,B

Academic Year: 2022-23

Question Number	Solution	Marks Allotted
<u>1a</u>	<u>Part-A</u> $C(t) = 1 + 0.2e^{-60t} - 1.2e^{-10t}$ $R(s) = \frac{1}{s}$ Response is $c(t) = 1 + 0.2e^{-60t} - 1.2e^{-10t}$ $C(s) = \frac{600}{s(s^2 + 70s + 600)}$ $C(s) = \frac{600}{s^2 + 70s + 600}$ $\omega_n = 24.4948 \text{ rad/sec}$ $\xi = 1.428$ System is over damped as $\xi > 1$	<u>2M</u> <u>3M</u> <u>1M</u> <u>1M</u> <u>1M</u>
<u>b</u>	Derivation of standard form of transient response: second order system. $\xi = \frac{1}{2\sqrt{KT}}$	<u>7M</u>

CONTD. →

SCHEME & SOLUTION

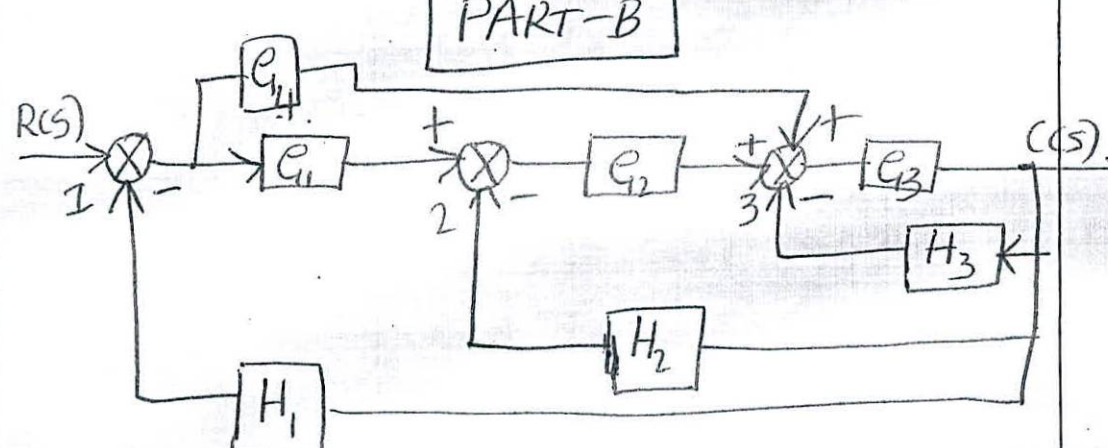
IA Test No: II

Subject: _____

Sub. Code: _____

Semester/Sec: _____

Academic Year: _____

Question Number	Solution	Marks Allotted
3a	PART-B  step-1 → Split the summing point (3) & separate the paths step-2 → Eliminate the minor feedback loop $G_3 / (1 + G_3 H_3)$ step-3 → combine the blocks in parallel & cascade step-4 → Eliminate the minor feedback loop $G_2 G_3 / (1 + G_2 H_3 + G_1 G_3 H_2)$ step-5 → combine the cascade blocks. step-6 → Eliminate the minor feedback loop $\frac{C(s)}{R(s)} = \frac{(G_4 + G_1 G_2) G_3}{1 + G_3 H_3 + G_1 G_3 H_2 + G_3 G_4 H_1 + G_1 G_2 G_3 H_1}$ b) Parts of time Response	2m 2m 2m 2m 2m 2m 12m 3m

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Department of Mechanical Engineering (NBA Accredited)

Internal Assessment Test-III for the AY: 2022-23 (ODD SEM)

CONTROL ENGINEERING

Sem /Sec: 7th A & B

Time: 1Hour

Date: 19/12/2022

Max. Marks: 30

Note: Answer any one full question from each module.

Q.No.	Module - 4	Marks	RBT Level	COs
1.	Sketch the root locus for a negative feedback system whose open loop transfer function is given by $G(s)H(s) = \frac{K}{s(s+3)(s^2+3s+4.5)}$ Also comment on the stability.	- 15 -	L3	CO5
OR				
2.	Construct the root locus for open loop transfer function is given by $G(s)H(s) = \frac{K(s+2)}{s(s+1)(s+8)}$	- 15 -	L3	CO5
Module - 5				
3.	Sketch the Bode plot for $G(s)H(s) = \frac{80}{s(s+2)(s+20)}$. Also obtain gain margin, phase margin and crossover frequencies and comment on the stability	- 15 -	L3	CO5
OR				
4.	The open loop transfer function of a unity feedback system is $G(s)H(s) = \frac{Ke^{-0.1s}}{s(1+0.1s)(1+s)}$. By drawing the Bode plot determine the value of K so that the gain margin of the system is 20dB.	- 15 -	L3	CO5

At the end of this course the students will be able to

CO5: Find the stability of the control system using Nyquist, Polar, Bode and root locus methods

Signature of Course Co-ordinator

HOD

Professor & Head

Department of Mechanical Engineering
Sapthagiri College of Engineering,
Bengaluru - 560 057.

Scrutinized by

1. (Dr. R.G.V.)

2.

Principal

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14/5, Chikkasandra, Hesaraghatta Main Road
Bengaluru - 560 057

SCHEME & SOLUTION

IA Test No: III

Subject: CONTROL ENGINEERING

Sub. Code: 18ME71

Semester/Sec: VII A&B

Academic Year: 2022-23 (ODD)

Question Number	Solution	Marks Allotted
①	$G(s)H(s) = \frac{K}{s(s+3)(s^2+3s+4.5)}$ Module-4 Angle of asymptotes, $\theta_A = \frac{(2q+1)180^\circ}{(p-2)}$ $\rightarrow \theta_{A_1} = 45^\circ, \theta_{A_2} = 135^\circ$ $\theta_{A_3} = 225^\circ, \theta_{A_4} = 315^\circ$ $45^\circ + 135^\circ + 225^\circ + 315^\circ = 0$ $\rightarrow$ Roots are at $s = -1.5, -1.5, -1.5$ $\rightarrow K = 25.3125$ $s = \pm j1.5$ $\rightarrow \phi_{P_1} = 135^\circ, \phi_{P_2} = 90^\circ, \phi_{P_3} = 45^\circ$ $\rightarrow \phi_d = -90^\circ$ at $-1.5 + j1.5$ $\phi_d = +90^\circ$ at $-1.5 - j1.5$ $\rightarrow$ stability of the system For $0 < K < 25.3125$ system is absolutely stable For $K = 25.3125$ system is marginally stable For $K > 25.3125$ system is unstable	1M 3M 1M 3M 2M 1M 15M

② CONTD...

SCHEME & SOLUTION

IA Test No: III

Subject: _____

Sub. Code: _____

Semester/Sec: _____

Academic Year: _____

Question Number	Solution	Marks Allotted																										
3	Module-5 Bode plot $G(s)H(s) = \frac{80}{s(s+2)(s+20)}$ $G(j\omega) = \frac{2+j0}{j\omega(1+0.5j\omega)(1+0.05j\omega)}$ Phase angle, $\phi = 0^\circ - 90^\circ - \tan^{-1}(0.5\omega) - \tan^{-1}(0.05\omega)$ <table><thead><tr><th>ω in rad/sec</th><th>Phase angle ϕ in degrees</th></tr></thead><tbody><tr><td>0.1</td><td>-93.14</td></tr><tr><td>0.2</td><td>-96.28</td></tr><tr><td>0.3</td><td>-99.39</td></tr><tr><td>0.4</td><td>-102.45</td></tr><tr><td>0.5</td><td>-105.46</td></tr><tr><td>1</td><td>-119.42</td></tr><tr><td>2</td><td>-140.70</td></tr><tr><td>5</td><td>-172.23</td></tr><tr><td>10</td><td>-195.23</td></tr><tr><td>20</td><td>-219.90</td></tr><tr><td>50</td><td>-245.90</td></tr><tr><td>100</td><td>-270.00</td></tr></tbody></table> Gain margin = +22dB Sketch → 7M Semilog sheet	ω in rad/sec	Phase angle ϕ in degrees	0.1	-93.14	0.2	-96.28	0.3	-99.39	0.4	-102.45	0.5	-105.46	1	-119.42	2	-140.70	5	-172.23	10	-195.23	20	-219.90	50	-245.90	100	-270.00	2M 15M 6M
ω in rad/sec	Phase angle ϕ in degrees																											
0.1	-93.14																											
0.2	-96.28																											
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