16/01/25

JGI ARKA JAIN University, Jharkhand — NAAC A GRADE, ACCREDITED UNIVERSITY			END SEM EXAMINATION School of Engineering & IT
Branch	ME / EEE / CSE	Program	B. Tech
Subject Name	Engineering Mathematics-III	Semester	III
		Year	January, 2025
Time: 3 Hour Max. Marks : 70	• Start writing from 2nd page onwards; don't Write on the 1st Page Backside • Answer all Questions of Section A (Compulsory) • Answer Any Four out of Six of Section B • Answer Any Three out of Five of Section C • Possession of Mobile Phone or any kind of Written Material, Arguments with the Invigilator or Discussion with Co-Student will comes under Unfair Means and will Result in the Cancellation of the Paper(s).		
Knowledge Level (KL)	K1 : Remembering	K3 : Applying	K5 : Evaluating
	K2 : Understanding	K4 : Analysing	K6 : Creating

Section A (Each question Carry 02 Marks from Q1-i to x – 20 Marks)

Q. N 1	QUESTIONS	Marks	COs	KL
i	Write the general solution of one- dimensional Wave equation.	2	CO2	K1
ii	Solve $Z= px + qy + \sqrt{1 + p2 + q2}$.	2	CO1	K2
iii	Write the relation between Mean Median and Mode.	2	CO2	K2
iv	Define the Lagrange's Auxiliary equation?	2	CO2	K2
v	Write down the general solution of one-dimensional heat flow equation	2	CO1	K1
vi	Give one example of Quasi linear partial differential equation	2	CO3	K5
vii	In a continuous random variable p.d.f. is given by $f(x)= 3x^2$; $0<x<1$ and $P(x<a)=P(x>a)$ then find a.	2	CO1	K1
viii	Write two dimensional Laplace equation.	2	CO1	K2
ix	Find the PDF by eliminating Arbitrary function $f(x+y+z, x^2+y^2-z^2)$.	2	CO3	K2
x	A p.d.f is given as $f(x)= x(x-1)$; $0<x<1$, check whether it is a probability density function or not?	2	CO1	K3

Section B (Answer any FOUR out of SIX) – 20 Marks
(Each question Carry 05 Marks)

Q. No.	QUESTIONS	Marks	COs	KL
2	Solve $(D^2 - 4DD' + 4D'^2)z = e^{x+2y}$	05	CO2	K5
3	The initial Value problem $U_{tt}=4\,U_{xx}$, $-\infty < x < \infty$, $t>0$ $U(x, 0)= -x$, $Ut(x,0) =0$ then Find the value of $U(2,2)$.	05	CO2	K5
4	Solve $(x^2-y^2-z^2)p+2xyq=2xz$	05	CO2	K3
5	Find out Mean from the following data. Class Interval: 0-10 | 10-20 | 20-30 | 30-40 | 40-50 Frequency: 4 | 6 | 10 | 8 | 2	05	CO1	K3
6	The probability Mass function of a variabe X is X: 0 | 1 | 2 | 3 | 4 | 5 | 6 P(x): k | 3k | 5k | 7k | 9k | 11k | 13k (i). Find $p(x<4)$, $P(X>5)$, $P(3<x<6)$ (ii) what will be the minimum value of k so that $P(X<2)>3$.	05	CO1	K4
7	Solve $(D^2+3DD'+2D'^2)\,z=12xy$	05	CO1	K2

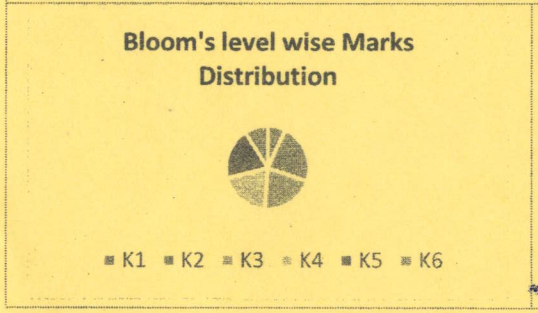
Section C (Answer any THREE out of FIVE) – 30 Marks
(Each question Carry 10 Marks)

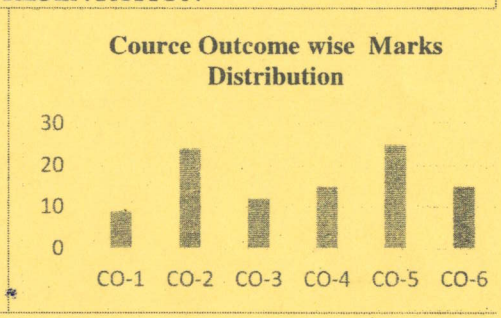
Q. No.	QUESTIONS	Marks	COs	KL
8	A string is stretched and fastened to two points L apart. Motion is started by displacing the string in the form $y=a\sin(\frac{\pi x}{l})$ from which it is released at time t=0. Show that the displacement of any point at a distance x from one end at a time t is given by $y(x,t)=a\sin(\frac{\pi x}{l})\cos(\frac{\pi ct}{l})$.	10	CO1	K4
9	Fit a straight line for the following data by least square method X: 1 | 2 | 3 | 4 | 6 | 8 Y: 2.4 | 3 | 3.6 | 4 | 5 | 6	10	CO1	K5
10	Derive the general solution of one dimensional wave equation.	10	CO1	K5
11	Classify the following partial differential equation $x^2\frac{\partial^2 u}{\partial t^2} + 3\frac{\partial^2 u}{\partial x \partial t} + x\frac{\partial^2 u}{\partial x^2} + 17\frac{\partial u}{\partial t} - 100u = 0$	10	CO3	K3
12	Find the CF and PI of the PDE: $(D^2+2DD'+D'^2)Z = \sin(2x+3y)$	10	CO2	K5

CO- Course Outcomes, **KL**- Knowledge Level, **PO** – Program Outcome

Course Outcomes	CO1	The mathematical tools needed in evaluating multiple integrals and their usage.
	CO2	The effective mathematical tools for the solutions of differential equations that model physical processes.
	CO3	The tools of differentiation and integration of functions of a complex variable that are used in various techniques dealing engineering problems
	CO4	An ability to apply effective, creative and innovative solutions, both independently and cooperatively, to current and future problems.
	CO5	A commitment to continuing learning and the capacity to maintain intellectual curiosity.
	CO6	An ability to develop statistical technique, data sampling.

GRAPHICAL REPRESENTATION





18/01/25

ARKAJAIN University Jharkhand		END TERM EXAMINATION School of Engineering & IT	
Branch	Mechanical Engineering	Program	B Tech
Subject Name	Material Science	Semester	III
		Year	January, 2025
Time: 3 Hour Max. Marks : 70	• Start writing from 2nd page onwards; **don't Write on the 1st Page Backside** • **Answer all Questions of Section A (Compulsory)** • **Answer Any Four out of Six of Section B** • **Answer Any Three out of Five of Section C** • **Possession of Mobile Phones** or any kind of **Written Material, Arguments with the Invigilator or Discussing with Co-Student** will comes under **Unfair Means** and will **Result** in the **Cancellation of the Papers.**		
Knowledge Level (KL)	**K1** : Remembering	**K3** : Applying	**K5** : Evaluating
	K2 : Understanding	**K4** : Analysing	**K6** : Creating

Section A (Each question Carry 02 Marks from Q1-i to Q1-x) – 20 Marks

Q. N 1	QUESTIONS	Marks	COs	KL
i	Enlist any five non-ferrous metals or alloys.	2	CO1	K1
ii	Define plasticity and Malleability property of material.	2	CO3	K2
iii	Define Crystal and Lattice.	2	CO1	K2
iv	Write the minerals & alloys of copper.	2	CO2	K1
v	What are the different types of primary bonds in solid?	2	CO1	K1
vi	What is fatigue failure?	2	CO5	K2
vii	Write the physical and mechanical properties of Copper.	2	CO5	K3
viii	Define Coordination number. What is the coordination number of BCC?	2	CO1	K2
ix	How many effective numbers of atoms in FCC structure? Write formula for atomic radius in FCC structure.	2	CO1	K2
x	What are the different types of cast irons?	2	CO4	K3

Section B (Answer any FOUR out of SIX) – 20 Marks
(Each question 5 Marks)

Q. No.	QUESTIONS	Marks	COs	KL
2	What is Steel? Describe any two types of Stainless steel.	5	CO4	K3
3	Derive the atomic packing efficiency of BCC crystal.	5	CO1	K2
4	What are the various alloying elements in steel and write their properties?	5	CO1	K4
5	Prove that atomic packing factor for FCC and HCP are same i.e 74%.	5	CO5	K1
6	State and Explain coordination number in crystals with example.	5	CO2	K3
7	Show directions [101] and [010] in unit cell.	5	CO3	K5

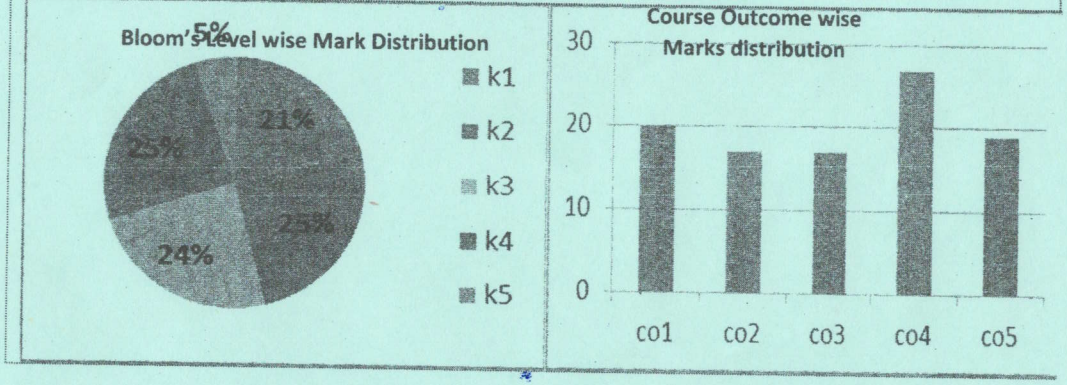
Section C (Answer any THREE out of FIVE) – 30 Marks
(Each question Carry 10 Marks)

Q. No.	QUESTIONS	Marks	COs	KL
8	Explain different types of crystal lattice with diagram.	10	CO5	K4
9	What is corrosion? Write the types of corrosion. What are the various measures to avoid corrosion in material?	10	CO2	K2
10	Describe the Nickel Alloys in terms of composition, properties and its application.	10	CO4	K1
11	Explain the Mechanical properties of Engineering materials.	10	CO3	K3
12	Draw a neat sketch of Iron carbon diagram. Write all the invariant reactions.	10	CO4	K4

CO- Course Outcomes, **KL**- Knowledge Level, **PO** – Program Outcome

Course Outcomes	CO1	Understand the crystal structures and atomic bonds. Classification of ferrous metals and their properties
	CO2	Describe non-ferrous metals, cutting tool materials and composites along with their properties. Principle of corrosion, their types and its prevention methods along with the various surface engineering processes.
	CO3	Apply various parameters to understand the properties and compositions of materials.
	CO4	Analyse the various phase diagrams of ferrous metals and alloys, composition and use of non-ferrous metals.
	CO5	Evaluate different methods of failure analysis and testing of materials.

GRAPHICAL REPRESENTATION



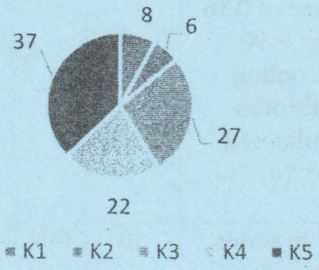
12	In a steam power cycle, the steam supply is at 15 bar and dry and saturated. The condenser pressure is 0.4 bar. Calculate the Carnot and Rankine efficiencies of the cycle. Neglect pump work.	10	CO5	K3	PO2

CO- Course Outcomes, **KL**- Knowledge Level, **PO** – Program Outcome

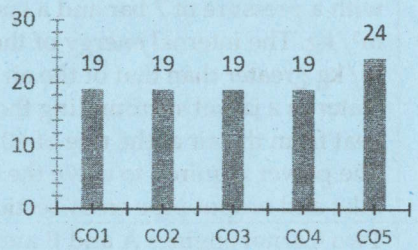
Course Outcomes	CO1	Describe the basic concepts and first law of thermodynamics.
	CO2	Describe the second law of thermodynamics and understand the concept of entropy and third law of thermodynamics.
	CO3	Understand the Pure Substances various thermodynamic processes
	CO4	Understand the concept of Mixtures of perfect gases and psychometric properties
	CO5	Develop the concept power cycle with description and representation on P-V and T-S diagram.

GRAPHICAL REPRESENTATION

Bloom's level wise marks distribution



Course outcomes wise marks distribution



21/01/25

ARKA JAIN University Jharkhand — NAAC GRADE A ACCREDITED UNIVERSITY

END TERM EXAMINATION
School of Engineering & IT

Branch	**Mechanical Engineering**	**Program**	**B. Tech**
Subject Name	**Thermodynamics**	**Semester**	**III**
		Year	**January, 2025**

Time: 3 Hour
Max. Marks : 70

- Start writing from 2nd page onwards; **don't Write on the 1st Page Backside**
- **Answer all Questions of Section A (Compulsory)**
- **Answer Any Four out of Six of Section B**
- **Answer Any Three out of Five of Section C**
- **Use of Steam Table/ Mollier's Chart/ Scientific Calculator is allowed**
- **Possession of Mobile Phones** or any kind of **Written Material, Arguments with the Invigilator or Discussing with Co-Student** will comes under **Unfair Means** and will **Result** in the **Cancellation of the Papers.**

Knowledge Level (KL)			
K1 : Remembering	**K3** : Applying	**K5** : Evaluating
K2 : Understanding	**K4** : Analysing	**K6** : Creating

Section A (Each question Carry 02 Marks from Q1-i to x) – 20 Marks

Q. N 1	QUESTIONS	Marks	COs	KL	PO
i	Write the equation for steady flow energy equation	2	CO1	K1	PO1
ii	Explain the term Isothermal process	2	CO1	K2	PO1
iii	State the term entropy	2	CO2	K1	PO1
iv	In thermometry which thermodynamics law is applicable	2	CO2	K2	PO1
v	Explain PMM1 in the thermodynamics.	2	CO3	K1	PO1
vi	What will be the work for constant volume process	2	CO3	K3	PO1
vii	What will be the heat for adiabatic process	2	CO4	K5	PO1
viii	Define the term isobaric process	2	CO4	K1	PO1
ix	Describe the components and key processes involved in the Basic Rankine cycle.	2	CO5	K2	PO1
x	Explain the role of a compressor and a turbine in the Brayton cycle.	2	CO5	K4	PO1

Section B (Answer any FOUR out of SIX) – 20 Marks
(Each question Carry 5 Marks)

Q. No.	QUESTIONS	Marks	COs	KL	PO
2	The specific heat capacity of the system during a certain process is given by Cp= (0.5 + 0.004 T) kJ/kg°C. If the mass of the gas is 5 kg and its temperature changes from 30°C to 115°C find: (i) Heat transferred; (ii) Mean specific heat of the gas.	5	CO1	K5	PO2
3	A vessel having a capacity of 0.05 m3 contains a mixture of saturated water and saturated steam at a temperature of 245°C. The mass of the liquid present is 10 kg. Examine the following: (i) The pressure, (ii) The mass, (iii) The specific volume, (iv) The specific enthalpy, (v) The specific entropy, and (vi) The specific internal energy.	5	CO2	K5	PO2
4	A 10 kg of fluid per minute goes through a reversible steady flow process. The properties of fluid at the inlet are: P1 = 1.5 bar, ρ1 = 26 kg/m3, C1 = 110 m/s and u1 = 910 kJ/kg and at the exit are P2 = 5.5 bar, ρ2 = 5.5 kg/m3, C2 = 190 m/s and u2 = 710 kJ/kg. During the passage, the fluid rejects 55 kJ/s and rises through 55 meters. Determine: (i) The change in enthalpy (Δ h); (ii) Work done during the process (W).	5	CO3	K5	PO3
5	An ideal Carnot engine operates between a high-temperature reservoir at 600 K and a low-temperature reservoir at 300 K. If the engine absorbs 500 kJ of heat from the high-temperature reservoir, calculate: i) The work done by the engine .ii) The heat rejected to the low-temperature reservoir. Iii) The thermal efficiency of the engine.	5	CO4	K3	PO4
6	With a neat sketch explain the working process of Rankine cycle with its pv diagram.	5	CO5	K4	PO2
7	Describe the Basic Vapor Compression cycle commonly used in refrigeration and air conditioning systems.	5	CO5	K4	PO3

Section C (Answer any THREE out of FIVE) – 30 Marks
(Each question Carry 10 Marks)

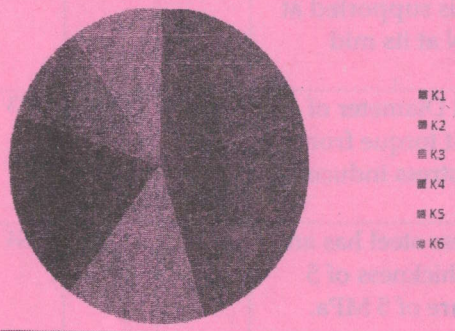
Q. No.	QUESTIONS	Marks	COs	KL	PO
8	A cylinder contains 1 kg of a certain fluid at an initial pressure of 25 bar. The fluid is allowed to expand reversibly behind a piston according to a law pV^2 = constant until the volume is doubled. The fluid is then cooled reversibly at constant pressure until the piston regains its original position; heat is then supplied reversibly with the piston firmly locked in position until the pressure rises to the original value of 25 bar. Calculate the net work done by the fluid, for an initial volume of 0.05 m^3.	10	CO1	K5	PO2
9	A steel flask of 0.04 m^3 capacity is to be used to store nitrogen at 120 bar, 20°C. The flask is to be protected against excessive pressure by a fusible plug which will melt and allow the gas to escape if the temperature rises too high. (i) How many kg of nitrogen will the flask hold at the designed conditions? (ii) At what temperature must the fusible plug melt in order to limit the pressure of a full flask to a maximum of 150 bar?	10	CO2	K5	PO3
10	In an air compressor air flows steadily at the rate of 0.5 kg/s through an air compressor. It enters the compressor at 6 m/s with a pressure of 1 bar and a specific volume of 0.85 m^3/kg and leaves at 5 m/s with a pressure of 7 bar and a specific volume of 0.16 m^3/kg. The internal energy of the air leaving is 90 kJ/kg greater than that of the air entering. Cooling water in a jacket surrounding the cylinder absorbs heat from the air at the rate of 60 kJ/s. Calculate: (i) The power required to drive the compressor; (ii) The inlet and output pipe cross-sectional areas.	10	CO3	K3	PO2
11	Two Carnot engines A and B are connected in series between two thermal reservoirs maintained at T_1 = 1000 K and T_2 = 100 K, respectively. Engine A receives 1700 kJ of heat from the high-temperature reservoir and rejects heat to the Carnot engine B. Engine B takes in heat rejected by engine A and rejects heat to the low-temperature reservoir. If engines A and B have equal thermal efficiencies, Test the following, (i) The heat rejected by the engine B. (ii) The temperature at which heat is rejected by engine A and (iii) The work done during the process by engines, A and B, respectively. If the engines A and B deliver equal work, determine (iv) The amount of heat taken in by engine B and (v) The efficiencies of engines A and B.	10	CO4	K4	PO3

CO- Course Outcomes, **KL**- Knowledge Level, **PO** – Program Outcome

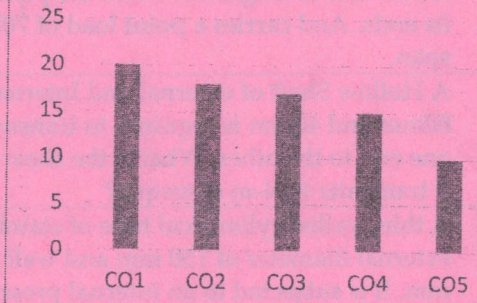
Course Outcomes	CO1	Remember the definition of stress and strain. Find the changes in axial, lateral and volumetric dimensions
	CO2	Understand the phenomenon of shear force and bending moment and draw the S.F. & B.M diagrams of for UDL and Point loads.
	CO3	Apply various approaches to calculate thermal stresses, in bodies of uniform section and composite sections. Obtain expressions for instantaneous stress developed in bodies subjected to different loads.
	CO4	Analyze the theory of bending and deflection of beam.
	CO5	Evaluate and Compare strength and weight of solid and hollow shafts of the same length and material and compute the stress and deflection of the closed coil helical spring.

GRAPHICAL REPRESENTATION

Blooms Level wise marks Distribution



Course Outcome Wise Marks Distribution



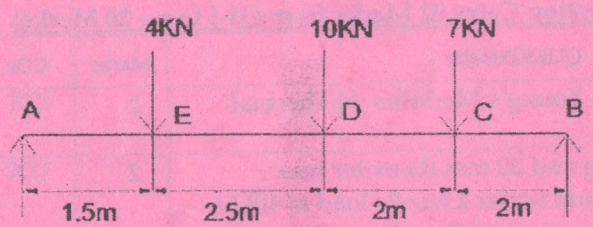
23/01/25

JGi	**ARKA JAIN University** Jharkhand	NAAC GRADE A ACCREDITED UNIVERSITY	**END SEM EXAMINATION School of Engineering & IT**	
Branch	**Mechanical Engineering**		**Program**	**B. Tech**
Subject Name	**Strength of Materials**		**Semester**	**III**
			Year	**January, 2025**
Time: 3 Hour Max. Marks : 70	• Start writing from 2nd page onwards; <u>don't Write on the 1st Page Backside</u> • **Answer all Questions of Section A (Compulsory)** • **Answer Any <u>Four out of Six of Section B</u>** • **Answer Any <u>Three out of Five of Section C</u>** • **Possession of <u>Mobile Phone</u>** or any kind of **<u>Written Material, Arguments with the Invigilator or Discussion with Co-Student</u>** will comes under **<u>Unfair Means</u>** and will **<u>Result</u>** in the **<u>Cancellation of the Paper(s)</u>**.			
Knowledge Level (KL)	**K1** : Remembering	**K3** : Applying	**K5** : Evaluating	
	K2 : Understanding	**K4** : Analysing	**K6** : Creating	

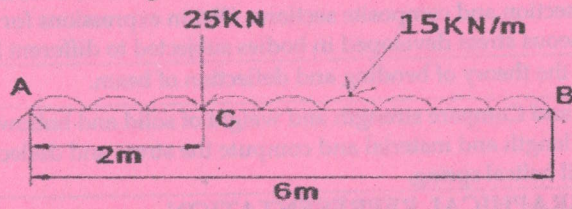
<u>Section A (Each question Carry 02 Marks from Q1-i to x – 20 Marks)</u>

Q. N 1	QUESTIONS	Marks	COs	KL
i	Define these terms a) Young's Modulus b) Thermal Stress	2	CO1	K1
ii	A brass rod 1.5m long and 20 mm diameter was found to deform 1.9 mm under a tensile load of 40kN. Calculate the modulus of elasticity of the rod.	2	CO2	K2
iii	Write Sign Convention used for shear force and bending moment diagram.	2	CO2	K1
iv	What is thermal stress? Write expression for it.	2	CO1	K1
v	Where maximum shear force will act in a cantilever beam loaded with point load at free end?	2	CO3	K2
vi	What is bending stress? Also write formula for Bending stress.	2	CO3	K1
vii	Define Section Modulus of Beam.	2	CO3	K2
viii	What do you understand by Torsion of Shaft?	2	CO5	K3
ix	What types of stress will induced in a helical spring and why?	2	CO5	K3
x	How to differentiate thin and thick cylinders?	2	CO4	K4

Section B (Answer any FOUR out of SIX) – 20 Marks
(Each question Carry 05 Marks)

Q. No.	QUESTIONS	Marks	COs	KL
2	Define thermal Stress and Strain. Find value of thermal stress in a steel bar which is fixed at both ends when temperature increases from 35°C to 100°C. Use linear Expansion Coefficient for Steel (α) = 12×10^{-6} / °C and E = 2×10^5 MN/m².	5	CO1	K3
3	Draw shear force and bending moment diagram for a cantilever beam of length 5 m subjected to UDL of 2kN/m on entire length and a point load of 3kN at mid span.	5	CO2	K2
4	Draw Shear Force and Bending Moment Diagram for beam Shown in Figure.  	5	CO2	K3
5	What do you understand by 'Pure Bending'? Write Assumptions in theory of pure bending. Also write formula for bending stress and define each term.	5	CO2	K1
6	A Circular shaft of 60mm diameter is required to transmit torque from one shaft to another. Find the safe torque, which the shaft can transmit, if shear stress is not to exceed 40MPa.	5	CO5	K3
7	A thin cylindrical pressure vessel has an internal diameter of 400 mm and wall thickness of 10 mm. It is subjected to an internal pressure of 2 MPa. Calculate: a) The longitudinal stress in the cylinder wall. b) The hoop stress in the cylinder wall.	5	CO4	K4

Section C (Answer any THREE out of FIVE) – 30 Marks
(Each question Carry 10 Marks)

Q. No.	QUESTIONS	Marks	COs	KL
8	A Steel Bar of 600 mm² cross sectional area is carrying loads as shown in fig. Determine the elongation of the bar. Take E= 200 GPa for Steel.  	10	CO1	K2
9	Draw Shear force and bending Moment diagram for beam shown in figure.  	10	CO2	K1
10	Calculate the maximum stress induced in a cast iron pipe of external diameter 40mm and internal diameter 20mm and of length 5m when the pipe is supported at its ends. And carries a point load of 70N at its mid span.	10	CO4	K5
11	A Hollow Shaft of external and Internal Diameter of 80mm and 40mm is required to transmit torque from one end to the other. What is the shear stress induced if it transmits 4kN-m of torque?	10	CO5	K3
12	A thin-walled cylindrical tube of stainless steel has an external diameter of 150 mm and wall thickness of 5 mm. It is subjected to an internal pressure of 5 MPa. Calculate: a) The hoop stress developed in the tube. b)The hoop strain in the tube assuming the modulus of elasticity (Young's modulus) for stainless steel is 200 GPa.	10	CO3	K4

29/01/25

ARKA JAIN University, Jharkhand (NAAC GRADE A ACCREDITED UNIVERSITY)			END TERM EXAMINATION School of Engineering & IT
Branch	Mechanical Engineering	Program	B. Tech
Subject Name	Basic Electronics Engineering	Semester	III
		Year	January, 2025
Time: 3 Hour Max. Marks : 70	• Start writing from 2nd page onwards; **don't Write on the 1st Page Backside** • **Answer all Questions of Section A (Compulsory)** • **Answer Any Four out of Six of Section B** • **Answer Any Three out of Five of Section C** • **Possession of Mobile Phones** or any kind of **Written Material, Arguments with the Invigilator or Discussing with Co-Student** will comes under **Unfair Means** and will **Result** in the **Cancellation of the Papers**.		
Knowledge Level (KL)	**K1 :** Remembering	**K3 :** Applying	**K5 :** Evaluating
	K2 : Understanding	**K4 :** Analysing	**K6 :** Creating

Section A (Each question Carry 02 Marks from Q1-i to Q1-x) – 20 Marks

Q. N 1	QUESTIONS	Marks	COs	KL	PO
i	What is a P-N junction diode?	2	CO1	K1	PO2
ii	What is the ripple factor, and how is it reduced using a capacitor filter?	2	CO1	K3	PO1
iii	What is Zener breakdown?	2	CO2	K3	PO3
iv	Define common-mode and differential-mode inputs in an op-amp.	2	CO2	K5	PO4
v	What is the purpose of an integrator circuit?	2	CO3	K1	PO3
vi	What is the IC 555 timer, and what are its main operating modes?	2	CO3	K2	PO2
vii	What are the universal gates, and why are they called universal?	2	CO4	K1	PO4
viii	What is the difference between a half adder and a full adder?	2	CO4	K2	PO4
ix	Using Boolean laws, simplify the expression $F(A,B,C) = A\overline{B} + \overline{A}(B+C)$ B	2	CO5	K4	PO5
x	What is the IEEE frequency spectrum, and why is it important?	2	CO5	K6	PO6

Section B (Answer any FOUR out of SIX) – 20 Marks
(Each question 5 Marks)

Q. No.	QUESTIONS	Marks	COs	KL	PO
2	Draw and explain the V-I characteristics of a P-N junction diode.	5	CO3	K3	PO1
3	How does the 78XX series differ from the 79XX series in terms of output voltage?	5	CO3	K1	PO1
4	Describe the different input modes and parameters of an operational amplifier.	5	CO5	K4	PO4
5	Describe the internal structure and pin configuration of the IC 555 timer.	5	CO5	K5	PO2
6	What do you mean By K-Map? Minimize the following expression using a 4-variable K-map: $F(A,B,C,D) = \sum m(1, 3, 7, 11, 15)$	5	CO6	K1	PO5
7	Draw and explain the block diagram of the GSM (Global System for Mobile Communications) system.	5	CO4	K6	PO6

Section C (Answer any THREE out of FIVE) – 30 Marks
(Each question Carry 10 Marks)

Q. No.	QUESTIONS	Marks	COs	KL	PO
8	Describe the working principle of a full-wave rectifier.	10	CO3	K3	PO1
9	Explain the working principle of an operational amplifier.	10	CO2	K4	PO4
10	State and explain Barkhausen's criterion for oscillation.	10	CO5	K2	PO4
11	Describe the operation of different flip-flops SR, D, JK and T.	10	CO6	K3	PO5
12	Explain the role of the Base Station Controller (BSC) and the Mobile Switching Center (MSC) in the GSM architecture.	10	CO4	K6	PO6

CO- Course Outcomes, **KL**- Knowledge Level, **PO** -- Program Outcome

Course Outcomes	CO1	Understand the principles of semiconductor devices and their applications.
	CO2	Design an application using Operational amplifier
	CO3	Apply the use of timing circuits and oscillators.
	CO4	Analyze the analog and digital signals using logic gates, flip-flop as a building block of digital systems.
	CO5	Learn the basics of Electronic communication system.

GRAPHICAL REPRESENTATION