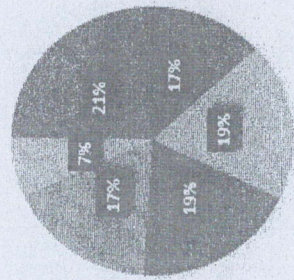


CO- Course Outcomes, **KL- Knowledge Level,** **PO – Program Outcome**

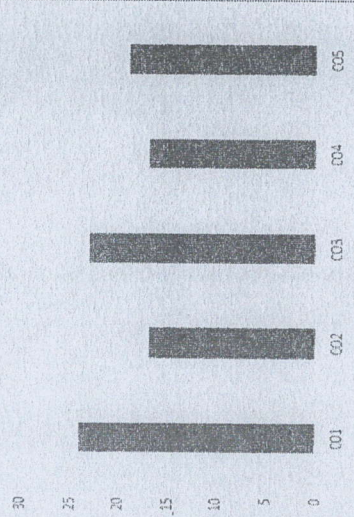
CO1	Understanding the crystal structures and atomic bonds. Classification of ferrous metals and their properties
CO2	Describe non-ferrous metals, cutting tool materials and composites along with their properties. Principle of corrosion, their types and its prevention methods along with the various surface engineering processes.
CO3	Apply various parameters to understand the properties and compositions of materials.
CO4	Analyze 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**

**Bloom's Level wise Marks Distribution**



Course Outcome Wise Marks Distribution



**ARKAJAIN University**  
Jharkhand

**END TERM EXAMINATION**  
School of Engineering & IT

Branch	Mechanical Engineering	B. Tech
Subject Name	Material Science	Semester Year
		3rd 2023/Odd
Time: 3 Hour Max. Marks : 70	<ul style="list-style-type: none"> <li>Start writing from 2nd page onwards; don't Write on the 1st Page Backside</li> <li>Answer all Questions of Section A (Compulsory)</li> <li>Answer Any Four out of Six of Section B</li> <li>Answer Any Three out of Five of Section C</li> <li>Possession of <u>Mobile Phones</u> or any kind of <u>Written Material, Arguments with the Invigilator or Discussing with Co-Student</u> will come under <u>Unfair Means</u> and will <u>Result</u> in the <u>Cancellation of the Papers.</u></li> </ul>	
Knowledge Level (KL)	K1 : Remembering K2 : Understanding K3 : Applying K4 : Analysing	K5 : Evaluating 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	Find Equivalent numbers of atoms in BCC and HCP	2	CO1	K1	PO2
ii	Write process to find miller indices for crystal planes.	2	CO1	K2	PO2
iii	Define these terms a) $\alpha$ -Ferrite b) Austenite	2	CO4	K1	PO2
iv	Identify these metals a) 20C8 b) FG300	2	CO2	K3	PO2
v	What is the Composition of Bronze?	2	CO3	K4	PO2
vi	What are the natural ores for Aluminium and Copper?	2	CO3	K1	PO3
vii	What are different outcomes of tensile tests?	2	CO5	K6	PO3
viii	Define the terms Creep and Fatigue.	2	CO5	K3	PO3
ix	What is wet corrosion?	2	CO3	K5	PO3
x	What do you understand by stress corrosion?	2	CO3	K4	PO3

**Section B (Answer any FOUR out of SIX) - 20 Marks**

(Each question carry 5 Marks)

Q.No.	QUESTIONS	Marks	COs	KL	PO
2	Write a note on "Bonds in solids".	5	CO1	K2	PO3
3	Derive Relation between lattice parameters (a) and atomic radius (r) for BCC and FCC	5	CO1	K1	PO3
4	What is the need of heat treatment of steels? Explain any two types of heat treatment process.	5	CO2	K3	PO2
5	Write difference between brass and bronze.	5	CO3	K4	PO2
6	What are the different testing methods for hardness? Explain any one hardness testing method with suitable diagrams.	5	CO5	K1	PO4
7	What is electrolytic cell? Write a typical chemical equation occurs in electrolytic cell with schematic diagram.	5	CO4	K6	PO4

**Section C (Answer any THREE out of FIVE) - 30 Marks-**

(Each question Carry 10 Marks)

Q.No.	QUESTIONS	Marks	COs	KL	PO
8	Explain edge and screw dislocation with neat sketch.	10	CO1	K2	PO2
9	Write a note on steels, its types and steel alloys.	10	CO2	K1	PO3
10	Write a descriptive note on Aluminium and its alloys.	10	CO3	K3	PO2
11	Explain Process of tensile test and also draw stress-strain curves for Mild Steel, Cast Iron, Rubber and Aluminium.	10	CO5	K4	PO4
12	Explain the process of Electroplating with neat sketch.	10	CO4	K1	PO4

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**ARKAJAIN**  
University  
Jharkhand

**END TERM EXAMINATION**  
School of Engineering & IT

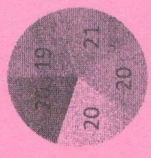
Branch	Mechanical Engineering	Program	B.Tech
Subject Name	Basic Electronics Engineering	Semester	3rd
		Year	2023/Odd
Time: 3 Hour Max. Marks : 70	<ul style="list-style-type: none"> <li>Start writing from 2nd page onwards; don't Write on the 1st Page Backside</li> <li>Answer all Questions of Section A (Compulsory)</li> <li>Answer Any Four out of Six of Section B</li> <li>Answer Any Three out of Five of Section C</li> <li>Possession of <u>Mobile Phones</u> or any kind of <u>Written Material, Arguments with the Invigilator or Discussing with Co-Student</u> will come under <u>Unfair Means</u> and will <u>Result in the Cancellation of the Papers.</u></li> </ul>		
Knowledge Level (KL)	K1 : Remembering	K3 : Applying	K5 : Evaluating
	K2 : Understanding	K4 : Analysing	K6 : Creating

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

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.

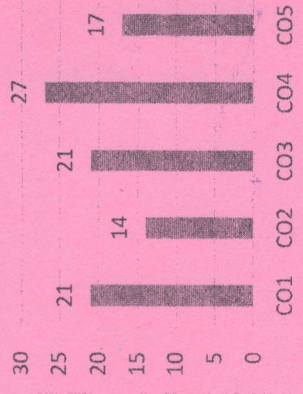
**GRAFICAL REPRESENTATION**

**Bloom's Level Wise Marks Distribution**



■ K1 ■ K2 ■ K3 ■ K4 ■ K5

**Course Outcomes Wise Marks Distribution**



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

Q.N	QUESTIONS	Marks	COs	KL	PO
1					
i	Define Operational Amplifier	2	CO2	K1	PO1 PO12
ii	Define 555 Timer	2	CO3	K1	PO1 PO12
iii	List the types of Operational Amplifier	2	CO2	K1	PO1 PO12
iv	What is Rectifier?	2	CO1	K1	PO1
v	Define Transistor. List the types of Transistor	2	CO1	K1	PO1
vi	Explain Modulation. Write the types of Modulation.	2	CO5	K2	PO1
vii	Name the most commonly used semiconductor element. Explain by giving at least two reasons?	2	CO1	K2	PO1
viii	Define Signals. List the types of Signals.	2	CO4	K2	PO1
ix	Define Operational Amplifier	2	CO3	K1	PO1
x	Define Transistor. List the types of Transistor	2	CO3	K1	PO1

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

Q. No.	QUESTIONS	Marks	COs	KL	PO
2	Solve the following Expression using K-Map i. $Y = \overline{B} + \overline{AC} + \overline{A}CD$ $F = \overline{BC} + \overline{AB} + \overline{BCD} + \overline{ABD} + \overline{ABCD}$ ii.	5	CO4	K4	PO2
3	An ac supply of 230 v is applied to a half wave rectifier circuit through a transformer turn ratio 10:1. Find out the output dc voltage.	5	CO1	K2	PO1 PO2
4	Explain Flip Flop. Name the types of Flip Flop with logic diagram.	5	CO4	K5	PO3
5	Explain Rectifier. Give a brief description of full wave bridge Rectifier.	5	CO1	K5	PO1
6	Explain 555 timer with pin diagram.	5	CO3	K4	PO2
7	Explain Cellular Concept with block diagram.	5	CO5	K1	PO1 PO2

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

Q. No.	QUESTIONS	Marks	COs	KL	PO
8	Prove that (i) $A.(A+B) = A$ (ii) $A + \overline{A}.B = A + B$	10	CO4	K3	PO2
9	Differentiate between P-type and N-type Semiconductors. Also name the doping materials used for their formation?	10	CO1	K2	PO1
10	Differentiate between Inverting and Non Inverting Amplifier.	10	CO2	K4	PO1 PO12
11	Write a short note on Amplitude Modulation	10	CO5	K3	PO2
12	Explain the applications of IC 555 and its applications as a stable and mono-stable multi-vibrators.	10	CO3	K5	PO2 PO3

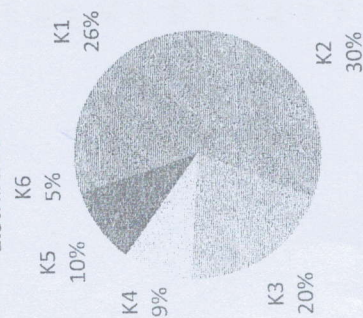


KL- Knowledge Level, PO – Program Outcome

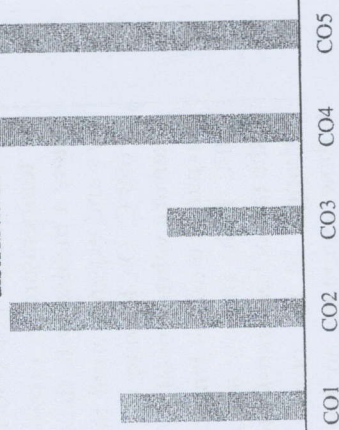
Course Outcomes	CO1	Describe the basic concepts and first law of thermodynamics.
	CO2	Describe the second law of thermodynamics and understand the concept of entropy and third law of thermodynamics.
	CO3	Understand the Pure Substances various thermodynamic processes
	CO4	Understand the concept of Mixtures 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**



Branch: Mechanical Engineering

Subject Name: Thermodynamics

Program: B. Tech

Semester: 3rd

Year: 2023/ Odd

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 come under Unfair Means and will Result in the Cancellation of the Papers.

Knowledge Level (KL)

K1: Remembering

K2: Understanding

K3: Applying

K4: Analysing

K5: Evaluating

K6: Creating

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

Q. N1	QUESTIONS	Marks	COs	KL	PO
i	What is meant by thermodynamics system? How do you classify it?	2	CO1	K1	PO1
ii	Define specific heat capacity at constant pressure & heat capacity at constant volume.	2	CO1	K1	PO1
iii	Define Zeroth law and first law of thermodynamics.	2	CO1	K1	PO1
iv	What is meant by reversible and irreversible process?	2	CO1	K1	PO1
v	What is meant by thermodynamic work? Define the terms equilibrium, path and process.	2	CO1	K4	PO1
vi	What is a steady flow process? Write the steady flow energy equation for turbine.	2	CO2	K1	PO1
vii	What is different between heat pump and refrigeration?	2	CO2	K1	PO1
viii	What is pure substance?	2	CO3	K1	PO1
ix	Define dryness fraction of steam OR What is quality of steam and wetness fraction?	2	CO3	K1	PO1

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

Q. No.	QUESTIONS	Marks	COs	KL	PO
8	Draw p-v, T-s and h-s diagram of Rankine cycle used in power plants and derive a formula for the cycle efficiency.	10	CO5	K3	PO2
9	State and prove Clausius inequality. Define the terms 'Irreversible process' and 'Reversible process'. Give an example of each.	10	CO4	K2	PO3
10	Air at a temperature of 15°C passes through a heat exchanger at a velocity of 30 m/s where its temperature is raised to 800°C. It then enters a turbine with the same velocity of 30 m/s and expands until the temperature falls to 650°C. On leaving the turbine, the air is taken at a velocity of 60 m/s to a nozzle where it expands until the temperature has fallen to 500°C. If the air flow rate is 2 kg/s, calculate a) the rate of heat transfer to the air in the heat exchanger b) the power output from the turbine assuming no heat loss and c) the velocity at the nozzle exit, assuming zero heat loss. Take enthalpy of air as $h = C_p \cdot t$ where $C_p$ is the specific heat = 1.005 kJ/kg K and t is the temperature.	10	CO2	K3	PO2
11	In a steam turbine, steam at 20 bar, 360° C is expanded to 0.08 bar. It then enters a condenser, where it is condensed to saturated liquid water. The pump feeds back the water into the boiler. Assuming ideal processes, determine per kg of steam the net-work and the cycle efficiency.	10	CO5	K2	PO3
12	Discuss about the causes of irreversibility with suitable diagrams.	10	CO4	K1	PO1

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

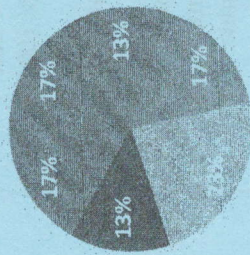
Q. No.	QUESTIONS	Marks	COs	KL	PO
2	A fluid at a pressure of 3 bar, and with specific volume of 0.18 m <sup>3</sup> /kg, contained in a cylinder behind a piston expands reversibly to a pressure of 0.6 bar according to a law, $p = C/v^2$ where C is a constant. Calculate the work done by the fluid on the piston.	5	CO1	K2	PO1
3	Explain clearly the difference between a non-flow and a steady flow process.	5	CO2	K2	PO1
4	Deduce the expression for the displacement work in an isothermal process.	5	CO5	K1	PO1
5	A fluid undergoes a reversible adiabatic compression from 0.5MPa, 0.2m <sup>3</sup> to 0.05m <sup>3</sup> according to the law, $PV^{1.3} = \text{constant}$ . Determine the change in enthalpy, internal energy and entropy, and the heat transfer and work transfer during the process.	5	CO2	K4	PO4
6	What do you mean by "Perpetual motion machine of first kind-PMM 1"?	5	CO4	K1	PO1
7	A vessel having a capacity of 0.05 m <sup>3</sup> contains a mixture of saturated water and saturated steam at a temperature of 245°C. The mass of the liquid present is 10 kg. Find 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	CO3	K6	PO4

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

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

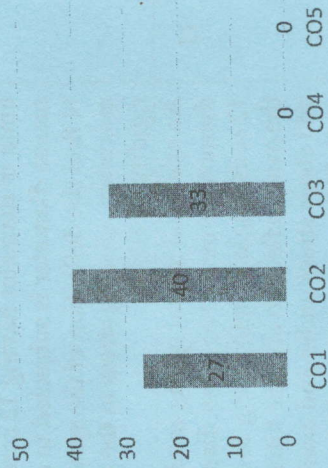
**GRAFICAL REPRESENTATION**

**Bloom's Level wise Marks Distribution**



■ K1 ■ K2 ■ K3 ■ K4 ■ K5 ■ K6

**Course Outcome wise Marks Distribution**



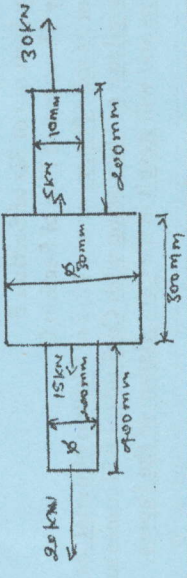
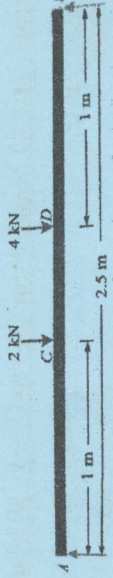
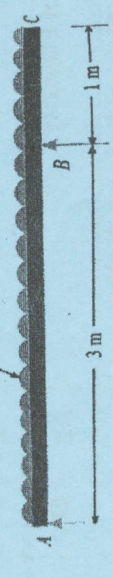
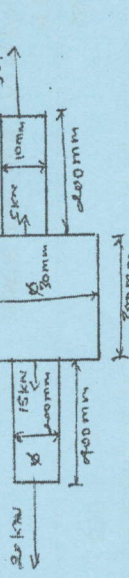
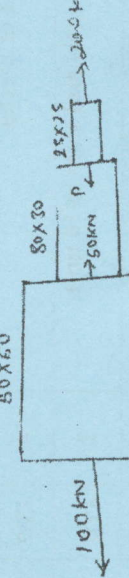
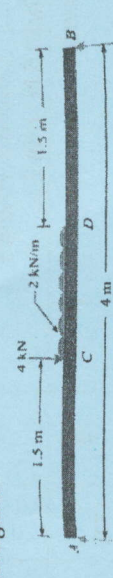
**END TERM EXAMINATION**  
School of Engineering & IT

Branch	Mechanical Engineering	Program	B.TECH
Subject Name	Strength of material	Semester	3rd
		Year	2023/Odd
Time: 3 Hour Max. Marks : 70	<ul style="list-style-type: none"> <li>Start writing from 2nd page onwards; don't Write on the 1st Page Backside</li> <li>Answer all Questions of Section A (Compulsory)</li> <li>Answer Any Four out of Six of Section B</li> <li>Answer Any Three out of Five of Section C</li> <li>Possession of Mobile Phones or any kind of Written Material, Arguments with the Invigilator or Discussing with Co-Student will come under <u>Unfair Means</u> and will result in the Cancellation of the Papers.</li> </ul>		
Knowledge Level (KL)	K1 : Remembering K2 : Understanding	K3 : Applying K4 : Analysing	K5 : Evaluating K6 : Creating

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

Q.N1	QUESTIONS	Marks	COs	KL	PO
i	To Define passion's ratio	2	CO1	K1	PO1
ii	To Define passion's ratio	2	CO1	K1	PO1
iii	To Define Modulus of Elasticity	2	CO2	K1	PO2
iv	A tensile force of 10KN is applied on a ductile material of length 40 mm due to which the Material gets elongated to 52.5 mm, then tensile strain of the material is	2	CO2	K1	PO2
v	To define tensile stress	2	CO2	K1	PO2
vi	To define thermal stress	2	CO2	K1	PO2
vii	Define Polar moment of Inertia	2	CO2	K1	PO2
viii	Define Moment of Inertia and state its SI unit.	2	CO2	K1	PO2
ix	The extension of a circular bar of diameter 30mm and length 4m under action of tensile Force of 250kn is..... (Consider young's modulus of bar, E= 2x10 <sup>5</sup> N/mm <sup>2</sup> ).	2	CO2	K1	PO2
x	To define Plastic material	2	CO2	K1	PO2

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

Q. No.	QUESTIONS	Marks	COs	KL	PO
2	<p>A throughout iron bar is 7.5m long and is 5cm is diameter for 2m is its length and 3cm is diameter for its remainder the bar is tension the stress is smallest section is 84KN/mm<sup>2</sup> find the total elongation of the bar is in tension and the stress in the smallest section is 84kn/mm<sup>2</sup> find the total elongation of the bar it E=200KN/mm<sup>2</sup></p> 	5	CO1	K2	PO1
3	<p>A simply supported beam AB of span 2.5M is carrying two point loads as show in figure.</p> 	5	CO2	K5	PO2
4	<p>A overhanging beam ABC is loaded as shown in figure</p> 	5	CO2	K5	PO2
5	<p>To find the elongation of bar shown in figure takes E=210GPA</p> 	5	CO2	K4	PO2
6	<p>To find the elongation of bar shown in figure and find the value of P takes E=210GPA</p> 	5	CO2	K2	PO2
7	<p>A simply supported beam of 4M span is carrying loads as shown in figure.</p> 	5	CO2	K4	PO2

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

Q. No.	QUESTIONS	Marks	COs	KL	PO
8	To draw the Stress - strain Diagram for mild steel and explain all term and point.	10	CO1	K2	PO1
9	<p>A) A steam boiler of 600 mm diameter is made up of 12 mm thick plate if the boiler is subjected to an internal pressure of 2.5 MPa find the circumferential and longitudinal stress induced in the boiler plate.</p> <p>B) A cylindrical shell of 1.4 M diameter is made of 18 mm thick plate find the circumference and longitudinal stress in the plate. if the boiler is subjected to an internal pressure of 2.4 MPa take efficiency of the joint as 70%</p>	10	CO1	K2	PO1
10	<p>A Closely coiled helical spring of round Steel wire 6mm in diameter having 12 complete coil of 60 mm means diameter is subjected to an axial load of 100 N find the deflection of the spring and the maximum sharing stress in the material modulus of rigidity C=80GPa</p>	10	CO2	K5	PO2
11	<p>An open coil helical spring made up of 12 mm diameter wire and of mean diameter of 100 mm has 12 coils, angle of helix being 15 degree determine the axial deflection and the intensity of bending and shear stress under and axial load of 500 N take as C=80Gpa and E=200 GPA</p>	10	CO2	K2	PO2
12	<p>A.) A Gas cylinder of internal diameter 40 mm is 5 mm thick if the tensile stress in the material is not to exceed 30 mega Pascal find the maximum pressure which can be allowed in the cylinder</p> <p>B.) A thin cylindrical shell of 400 mm diameter is to be designed for an internal pressure of 2.4 mega Pascal find the suitable thickness of the sale if the allowed circumference is 50 mega Pascal</p>	10	CO5	K4	PO5