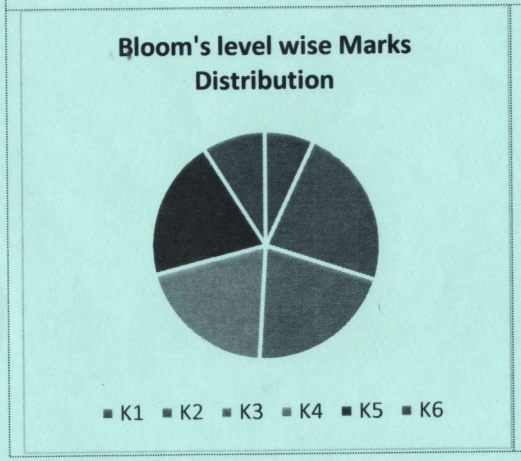
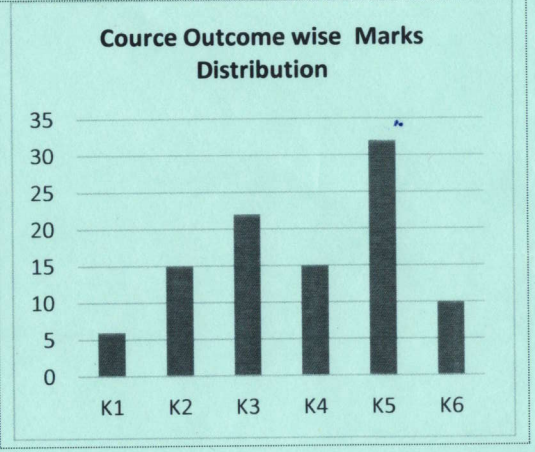
CO- Course Outcomes, **KL**- Knowledge Level, **PO** – Program Outcome

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





JGI **ARKA JAIN University** Jharkhand — NAAC GRADE A ACCREDITED UNIVERSITY

[17-01-2026]
END SEM EXAMINATION
School of Engineering & IT

Program	**EEE /ME/CSE /AIDS(IBM)/AIML**	**Branch**	**B. Tech**
Subject Name	**Engineering Mathematics-III**	**Session**	**Odd, 2025-26**
Semester	**III**	**Year**	**Jan, 2026**

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	If $u_0 = 3$, $u_1 = 12$, $u_2 = 18$, $u_3 = 2000$, $u_4 = 100$, calculate Δu_0.	2	CO3	K1
ii	Write the relation between Mean, Median and Mode.	2	CO1	K2
iii	Write the Lagrange's Interpolation formula.	2	CO2	K2
iv	Write the formula for numerical differentiation.	2	CO1	K2
v	Find the variance for the data given : X: 0 1 2 3 $p(x)$: $\frac{1}{8}$ $\frac{3}{8}$ $\frac{3}{8}$ $\frac{1}{8}$	2	CO5	K1
vi	Define sample in sampling theory.	2	CO3	K5
vii	Two dice are thrown simultaneously. What is the probability of getting two numbers whose product is even?	2	CO2	K1
viii	Determine which numerical method is best suited for solving nonlinear equations with rapid convergence, and justify your choice.	2	CO1	K2

ix	Define Random Variable with an example.	2	CO3	K2
x	If the value of mode is 25.5 and median is 16.5 then find mean?	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	Find the real root of the equation x^3 - 4x -9= 0 using Bisection Method.	05	CO2	K5
3	A random variable X has the following probability function X: 0 1 2 3 4 5 6 7 P(x): 0 k 2k 2k 3k K^2 $2K^2$ $7K^2+k$ Find (i) value of k (ii) Evaluate P(X<6)	05	CO2	K5
4	Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by Simpson's 1/3 rule.	05	CO2	K3
5	Find the value of Y when X= 10, by Lagrange's interpolation formula x: 5 6 9 11 y: 12 13 14 16	05	CO1	K3
6	Find u_9 if $u_0 = 14, u_4 = 24, u_8 = 32, u_{12} = 35, u_{16} = 40$, using Gauss forward formula	05	CO1	K4
7	Find mean and variance: x={ 1,2,3,4,5,6} ; x= no. of appears on the die X: 0 1 2 3 4 5 6 p(x): 0 $\frac{1}{6}$ $\frac{1}{6}$ $\frac{1}{6}$ $\frac{1}{6}$ $\frac{1}{6}$ $\frac{1}{6}$	05	CO2	K2

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

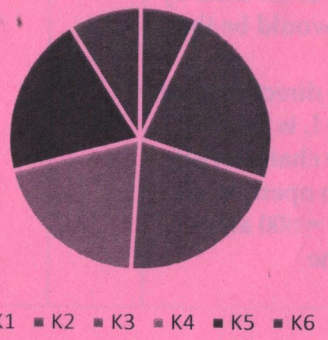
Q. No.	QUESTIONS	Marks	COs	KL
8	Evaluate $\int_0^6 x \sec x \, dx$ using 8 intervals by Trapezoidal rule.	10	CO1	K4
9	If X is a continuous random variable with the p.d.f $f(x)=\begin{cases} a(2x-x^2), & 0 \le x \le 2 \\ 0, & otherwise \end{cases}$ Find (i) a (ii) p(x>1).	10	CO3	K5
10	Fit a straight line 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	CO6	K6
11	Find the value of y for x=0.1 by Picard's method. Given that $\frac{dy}{dx} = \frac{y-x}{y+x}$; y(0) =1.	10	CO3	K3
12	Find the real root of the equation x^3 - 3x - 5= 0 by Newtons-Raphson method	10	CO2	K5

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

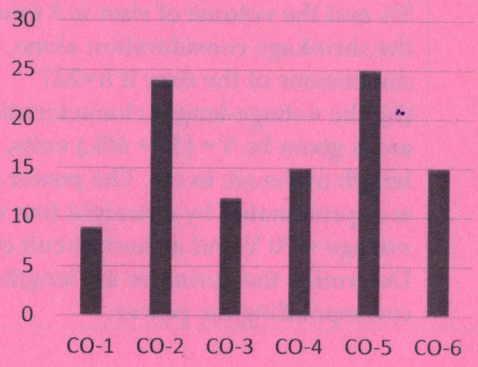
Course Outcomes	CO1	Elaborate the fundamentals of various molding, casting techniques and furnaces.
	CO2	Identify the importance of permanent joining and principle behind different welding processes.
	CO3	Explain the concepts of solid-state welding processes.
	CO4	Understand the concepts of rolling and sheet metal operations in metal working.
	CO5	Elaborates the uniqueness of extrusion, forging and high energy rate forming processes in metal working.

GRAPHICAL REPRESENTATION

Bloom's level wise Marks Distribution



Cource Outcome wise Marks Distribution



ARKA JAIN University
Jharkhand

NAAC GRADE A
ACCREDITED UNIVERSITY

[02-02-2026]
END SEM EXAMINATION
School of Engineering & IT

Program	**Mechanical Engineering**	**Branch**	**B. Tech**
Subject Name	**Production Technology-I**	**Session**	**Odd, 2025-26**
Semester	**III**	**Year**	**Jan, 2026**

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	Why are allowances given in pattern?	2	CO1	K1
ii	What do you understand by the aspiration effect associated with casting?	2	CO1	K2
iii	What are the functions of flux, coated on the electrode of manual metal arc welding?	2	CO2	K2
iv	Write down the names of different components used in oxy-acetylene gas welding process.	2	CO2	K1
v	What is the difference between solid-state and fusion welding?	2	CO3	K1
vi	Write down the applications of explosive and friction stir welding processes.	2	CO3	K3
vii	What is the neutral point in rolling?	2	CO4	K3
viii	What is the difference between blanking and punching? Name one product produced by each process.	2	CO4	K3
ix	State the differences between hot forming and cold forming.ssss	2	CO5	K2
x	Differentiate between direct and indirect extrusion processes.	2	CO5	K2

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

Q. No.	QUESTIONS	Marks	COs	KL
2	Why does the permeability of green sand first increase and then decrease with an increase in moisture content? Why are grains finer in size on the mould face when compared to grains away from the mould face?	05	CO1	K6
3	Indicate, why HAZ is found to be the weakest in most of the metallic welding? How does the strength of soldering joint vary with the gap between the base sheets? Show strength vs gap plot.	05	CO2	K6
4	State any five welding defects along with their causes and remedies.	05	CO3	K2
5	Sketch any five casting defects, stating their causes and rentedies.	05	CO1	K2
6	With a neat schematic diagram, explain the tube extrusion process. Label the different parts on the sketch.	05	CO5	K1
7	With neat sketches, show the different configurations of rolling mills. State the features of each configuration.	05	CO4	K2

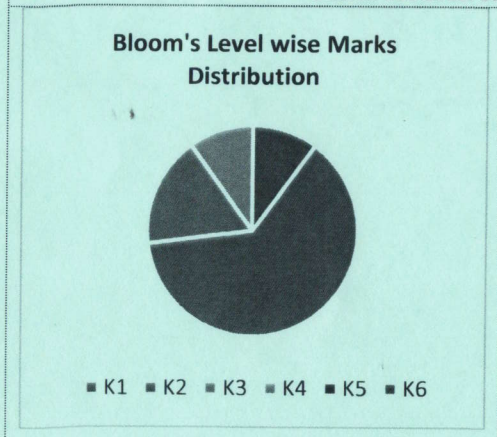
Section C (Answer any THREE out of FIVE) – 30 Marks
(Each question Carry 10 Marks)

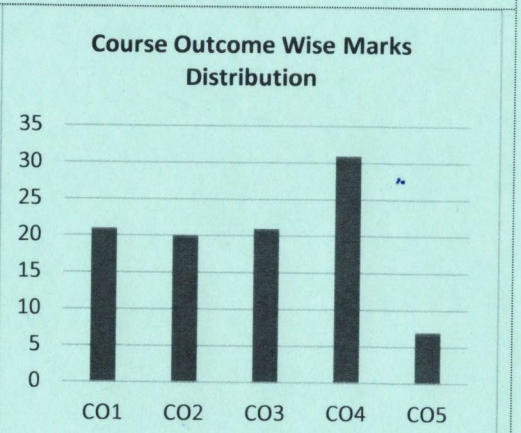
Q. No.	QUESTIONS	Marks	COs	KL
8	Prove that the ratio of solidification time of optimum cylindrical riser to optimum cuboid riser of same volume is given by $\frac{t_{s-cylinder}}{t_{s-cuboid}} = 4\left(\frac{1}{2\pi}\right)^{\frac{2}{3}}$. Consider both are side risers.	10	CO1	K4
9	A plate of cross-section 30 cm × 10 mm is being cold rolled with 15% reduction in area, using 60 cm dia rolls. The shear yield stresses of the material at the beginning and end of the process are 0.4 and 0.5 kN/m², respectively. Calculate (i) final plate thickness (ii) angle subtended by the deformation zone at the roll centre (iii) location of neutral point, and (iv) average shear yield stress during the process.	10	CO4	K5
10	Consider a full-penetration arc weld pass on a steel plate under the following conditions: Plate thickness =8 mm, Welding current = 200 A, Voltage =30 V, Travel speed = 6 mm/s, Heat transfer efficiency = 80%, Weld joint area = 30 mm2, Energy required for melting =15 J/mm3. Estimate (i) Net Heat input rate (ii) Heat used for melting and (iii) Melting efficiency.	10	CO2	K5
11	An aluminum plate of dimensions 30mm×30mm×200mm is forged between two flat dies to the final dimensions of 15mm × 60 mm×200mm. Determine the peak forging force if coefficient of forging is 0.1. The tensile yield stress for aluminum is 25 N/mm2 and the strain-hardening characteristics for aluminum are given by $\sigma_Y = 25 + 15\varepsilon^{0.25} N/mm^2$.	10	CO5	K5
12	(a) A cylindrical riser is attached to the side of a steel plate casting having dimensions 20cm × 15cm × 5cm. The volume shrinkage of steel during solidification is 3% and the volume of riser is 3 times that of dictated by the shrinkage consideration alone. What would be the dimensions of the riser if h=2d? (b) The voltage-length characteristics of a direct-current arc is given by V= (30 + 60L) volts, where L is the length of the arc in cm. The power source characteristic is approximated by a straight line with an open circuit voltage = 70 V and a short-circuit current = 800 amp. Determine the optimum arc length and the corresponding arc power.	10	CO1	K5

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





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[30-01-2026]
END SEM EXAMINATION
School of Engineering & IT

Program	**Mechanical Engineering**	**Branch**	**B. Tech**
Subject Name	**Metallurgy & Material Science**	**Session**	**Odd, 2025-26**
Semester	**III**	**Year**	**Jan, 2026**

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 carries 02 Marks from Q1-i to x – 20 Marks)

Q. N 1	QUESTIONS	Marks	COs	KL
i	Define a unit cell.	2	CO1	K1
ii	Name the three common crystal structures of metals.	2	CO1	K1
iii	What is the Atomic Packing Factor (APF)?	2	CO1	K2
iv	What is Burger's vector?	2	CO3	K2
v	Define a solid solution.	2	CO3	K1
vi	State Hume–Rothery rules.	2	CO3	K1
vii	What is eutectic reaction?	2	CO4	K2
viii	What is a TTT diagram?	2	CO4	K2
ix	Define hardenability.	2	CO4	K1
x	Which test is suitable to determine the endurance limit of a material under cyclic loading?	2	CO5	K3

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

Q. No.	QUESTIONS	Marks	COs	KL
2	Explain the BCC, FCC, and HCP crystal structures with neat sketches.	05	CO1	K2
3	Calculate the atomic packing factor (APF) for the BCC structure.	05	CO3	K3
4	Describe edge and screw dislocations with diagrams.	05	CO3	K2
5	Explain substitutional and interstitial solid solutions.	05	CO3	K2
6	Explain Austempering and Martempering.	05	CO4	K2
7	Describe various surface hardening methods.	05	CO5	K2

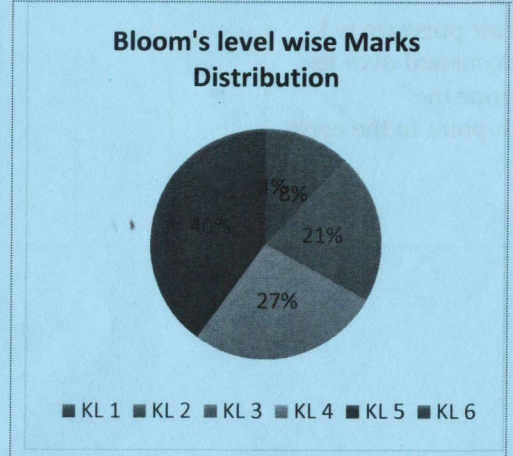
Section C (Answer any THREE out of FIVE) – 30 Marks
(Each question carries 10 Marks)

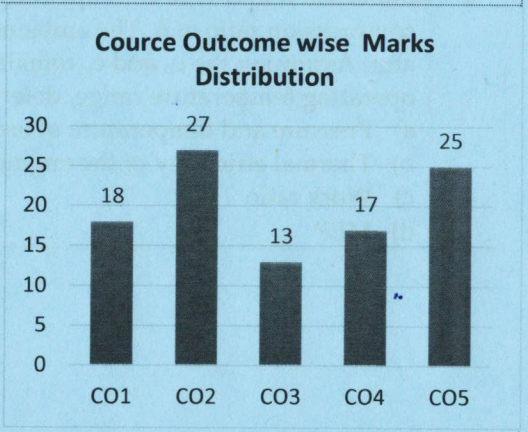
Q. No.	QUESTIONS	Marks	COs	KL
8	Draw a neat sketch of the Iron-Carbon diagram. Write all the invariant reactions.	10	CO4	K4
9	Explain various methods of corrosion control, including material selection, design, and environmental control.	10	CO2	K2
10	Explain continuous cooling transformation (CCT) diagrams and their applications.	10	CO4	K3
11	Explain classification, manufacturing, and applications of composites.	10	CO2	K2
12	Explain the unit cell and space lattice. Describe the seven crystal systems with suitable diagrams.	10	CO1	K2

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

Course Outcomes	CO1	Understand the basics of Thermodynamics
	CO2	Apply first and second laws of thermodynamics to different systems
	CO3	Determine the feasibility of a process w.r.to entropy changes
	CO4	Apply concepts of thermodynamic property relations to ideal gas and real gases
	CO5	Evaluate performance of power cycles and refrigeration cycles

GRAPHICAL REPRESENTATION





ARKA JAIN University Jharkhand — NAAC GRADE A ACCREDITED UNIVERSITY			[28-01-2026] END SEM EXAMINATION School of Engineering & IT
Program	Mechanical Engineering	**Branch**	B. Tech
Subject Name	Thermodynamics	**Session**	Odd, 2025-26
Semester	III	**Year**	Jan, 2026
Time: 3 Hour Max. Marks : 70	• Start writing from 2nd page onwards; **don't Write on the 1st Page** and **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** • **Steam Table may be allowed.** • **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	Define Zeroth Law of Thermodynamics.	2	CO1	K1
ii	Differentiate between temperature and Heat.	2	CO1	K3
iii	Draw p-V and T-s diagram for Carnot cycle.	2	CO3	K3
iv	State the Carnot theorem.	2	CO2	K2
v	What is the principle of increase of entropy?	2	CO3	K2
vi	Define sensible heat.	2	CO1	K2
vii	What is meant by dryness fraction of the steam?	2	CO1	K2
viii	List the advantages of using superheated steam in turbines.	2	CO4	K1
ix	Write down the TDS relations.	2	CO3	K3
x	Write some examples of irreversible process.	2	CO3	K4

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

Q. No.	QUESTIONS	Marks	COs	KL
2	What do mean by property? Distinguish between intensive and extensive	05	CO1	K3
3	Explain the following terms: a) System b) Cyclic Process c) State d) Path	05	CO1	K3
4	A heat engine receives heat at the rate of 1500 kJ/min and gives an output of 8.2 kW. Determine a) The thermal efficiency b) The rate of heat rejection	05	CO2	K3
5	Show the phase equilibrium diagram for a pure substance h-S plot with relevant constant property line.	05	CO3	K4
6	With a neat P-V and T –S diagram, derive an expression for the efficiency of a Brayton cycle	05	CO5	K5
7	A certain amount of gas is compressed from 1 bar and 0.1m^3 to 5 bar and 0.03m^3. The process is according to the law $pV^n = K$. Determine the magnitude and direction of work.	05	CO4	K5

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

Q. No.	QUESTIONS	Marks	COs	KL
8	A gas (v=0.014 m^3) expands polytropically from a pressure of 2.07 MPa to 207 kPa. The polytropic exponent n=1.35. Determine the work done by the by the gas during the expansion.	10	CO2	K5
9	A system undergoes a cyclic process: 1 ⟶ 2 ⟶ 3 ⟶ 4 The available data are presented in the following table. Work out the unknown parameters.	10	CO2	K4

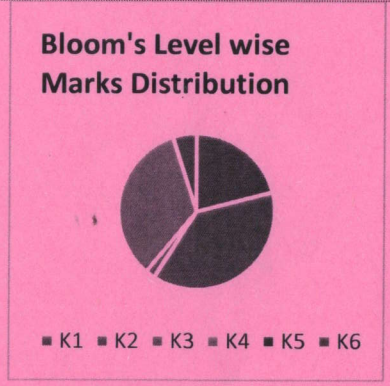
Process	Heat Transfer (kJ/min)	Work Transfer (kW)	Change in internal energy (kJ/min)
1-2	+800	5	ΔU_1
2-3	+400	W_{2-3}	+600
3-4	-400	W_{3-4}	ΔU_2
4-1	0	3	ΔU_3

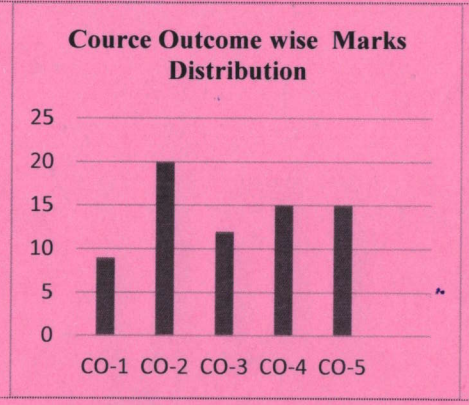
10	Describe the Carnot cycle on a T-s plot. Derive its efficiency.	10	CO5	K4
11	A steam sample at 2MPa has a specific volume of 0.09m^3 kg^{-1}. Determine the dryness fraction of the steam. Also calculate the specific enthalpy and specific entropy of the sample.	10	CO4	K5
12	An ideal SI engine operates between two temperature limits 300 K and 1700 K. It operates with a compression ratio of 6. The ambient air pressure is 1 atm. Assuming the c_p and c_v remain constant over its operating temperature range, determine the a) Pressure and temperature at each point in the cycle b) Thermal efficiency of the engine c) Work ratio d) MEP	10	CO5	K5

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

Course Outcomes	CO1	Understand basic gender concepts and socialization processes.
	CO2	Analyze different types of gender roles and relationships.
	CO3	Evaluate the division and valuation of labour in gender contexts.
	CO4	Analyze types and consequences of gender-based violence.
	CO5	Analyze gender representation in media and culture.

GRAPHICAL REPRESENTATION





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[20-01-2026]
END SEM EXAMINATION
School of Engineering & IT

Program	**EEE / ME / CSE / AIML / AIDS**	Branch	**B. Tech**
Subject Name	**Gender Sensitization**	**Session**	**Odd, 2025-26**
Semester	**III**	**Year**	**Jan, 2026**

Time: 1.5 Hour
Max. Marks: **35**

- Start writing from 2nd page onwards; **don't Write on the 1st Page Backside**
- **Answer all Questions of Section A (Compulsory)**
- **Answer Any Five out of Six of Section B**
- **Answer Any Two out of Four 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 01 Marks from Q1-i to v) – 05 Marks

Q. N 1	QUESTIONS	Marks	COs	KL
i	Which document allows third gender identity on official records in India? a) Driving license b) Aadhar Card c) Passport d) All of the above	01	CO1	KL1
ii	Lack of awareness about the third gender leads to: a) Equality b) Acceptance c) Discrimination d) Empowerment	01	CO2	KL4
iii	What does gender sensitization primarily aim to achieve? a) Promote one gender over another b) Create awareness and change attitudes towards gender equality c) Encourage traditional gender roles d) Limit participation of women in workplaces.	01	CO1	KL2
iv	Media can support third gender equality by: a) Spreading myths b) Showing negative images c) Promoting positive representation	01	CO3	KL5

	d) Avoiding the topic			
v	Which area is most affected by inequality faced by the third gender? a) Entertainment b) Education and employment c) Sports d) Tourism	01	CO1	KL3

Section B (Answer any FIVE out of SIX) – 10 Marks
(Each question Carry 02 Marks)

Q. No.	QUESTIONS	Marks	COs	KL
2	Define Gender.	02	CO1	KL2
3	Stereotype means?	02	CO2	KL1
4	Which legislation in India focuses on preventing sexual harassment at the workplace?	02	CO3	KL3
5	State down the meaning of Patriarchy.	02	CO3	KL2
6	What is sexual harassment?	02	CO2	KL5
7	Mention any two **rights of women** in India.	02	CO3	KL4

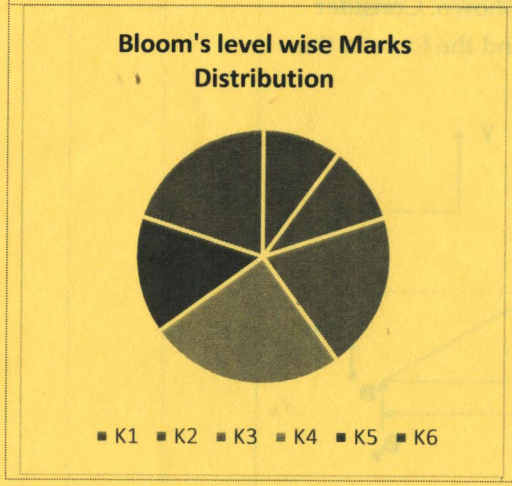
Section C (Answer any TWO out of FOUR) – 20Marks
(Each question Carry 10 Marks)

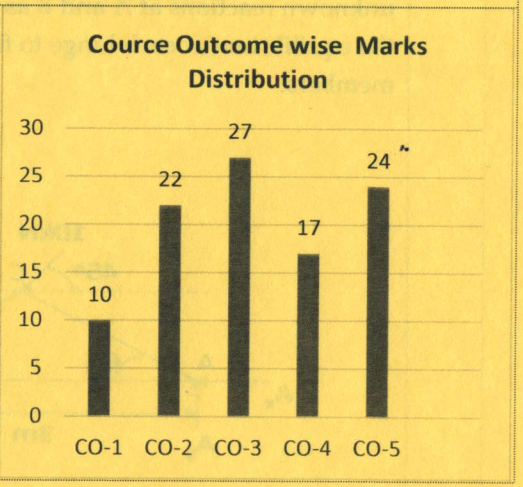
Q. No.	QUESTIONS	Marks	COs	KL
8	Briefly explain about the "Gender Sensitization".	10	CO2	KL2
9	Explain any 5 Equal rights.	10	CO1	KL5
10	Differentiate between the following: EQUALITY AND INEQUALITY	10	CO2	KL5
11	Explain in details – WOMANHOOD AND MANHOOD.	10	CO3	KL3

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

Course Outcomes	CO1	Identify the force systems for given conditions by applying the basics of mechanics
	CO2	Determine unknown force(s) of different engineering systems.
	CO3	Apply the principles of friction in various conditions for useful purposes.
	CO4	Find the centroid and center of gravity of various components in engineering systems
	CO5	Select the relevant simple lifting machine(s) for given purposes
	CO6	Apply the principles of friction in various conditions for useful purposes.

GRAPHICAL REPRESENTATION





ARKA JAIN University Jharkhand — NAAC GRADE A ACCREDITED UNIVERSITY

[22-01-2026]
END SEM EXAMINATION
School of Engineering & IT

Program	**Mechanical Engineering**	**Branch**	**B. Tech**
Subject Name	**Engineering Mechanics**	**Session**	**Odd, 2025-26**
Semester	**III**	**Year**	**Jan, 2026**

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)**.

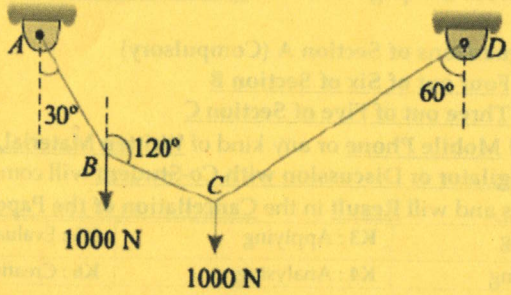
Knowledge Level (KL)			
	K1 : Remembering	**K3** : Applying	**K5** : Evaluating
	K2 : Understanding	**K4** : Analysing	**K6** : Creating

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

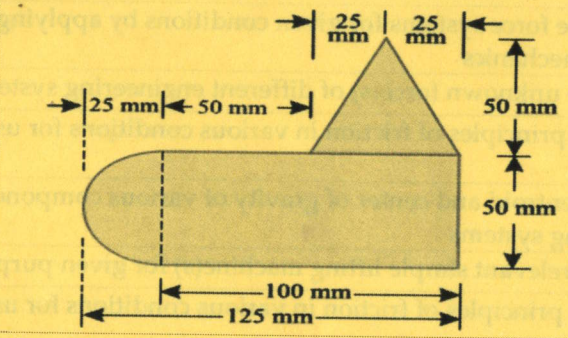
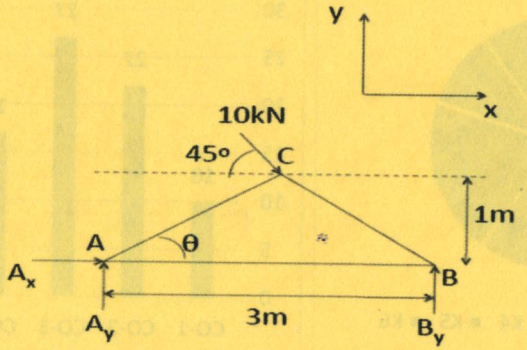
Q. N 1	QUESTIONS	Marks	COs	KL
i	State the principle of transmissibility of force.	2	CO1	KL1
ii	Differentiate between statics and dynamics	2	CO2	KL3
iii	What is a uniformly distributed load and a uniformly varying load?	2	CO3	KL4
iv	State Lami's theorem.	2	CO5	KL5
v	State any two laws of friction	2	CO4	KL4
vi	Define angle of repose	2	CO2	KL1
vii	Define centroid of a plane figure	2	CO3	KL3
viii	State any two assumptions made in the analysis of trusses	2	CO5	KL6
ix	What is meant by load and effort in a machine?	2	CO4	KL4
x	Write the expression for the velocity ratio of a simple wheel and axle.	2	CO2	KL1

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

Q. No.	QUESTIONS	Marks	COs	KL
2	Distinguish between particle, rigid body and flexible body	05	CO5	KL5

3	A string ABCD, attached to fixed points A and D has two equal weights of 1000 N attached to it at B and C. The weights rest with the portions AB and CD inclined at angles as shown in Figure below. Find the tensions in the portions AB, BC and CD of the string, if the inclination of the portion BC with the vertical is 120°.  **Fig. 5.5.**	05	CO4	KL4
4	Explain the equilibrium of a body on an inclined plane subjected to a force parallel to the plane.	05	CO5	KL5
5	Derive the centroid of a triangular lamina.	05	CO4	KL4
6	A solid body formed by joining the base of a right circular cone of height H to the equal base of a right circular cylinder of height h. Calculate the distance of the centre of mass of the solid from its plane face, when H = 120 mm and h = 30 mm.	05	CO3	KL2
7	Derive the expression for the velocity ratio of a simple screw jack and draw labelled diagram.	05	CO1	KL3

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

Q. No.	QUESTIONS	Marks	COs	KL
8	For coplanar concurrent forces there are different ways to find the resultant for system of forces	10	CO5	KL5
9	Find the expression for frictional forces on the points of contact of a ladder with the wall and floor. The ladder makes an inclination angle, theta, with the floor and phi with the wall.	10	C04	KL4
10	Determine the centroid of the given figure.  	10	CO5	KL5
11	Consider the FBD of the truss as shown to get the unknown reactions at A and B as shown. Consider the equilibrium at each hinge to find the force in the members.  	10	CO4	KL4
12	A single purchase crab winch, has the following details: Length of lever = 700 mm Number of pinion teeth = 12 Number of spur gear teeth = 96 Diameter of load axle = 200 mm It is observed that an effort of 60 N can lift a load of 1800 N and an effort of 120 N can lift a load of 3960 N. What is the law of the machine? Also find efficiency of the machine in both the cases.	10	CO4	KL4