CBCS SCHEME - Make-Up Exam

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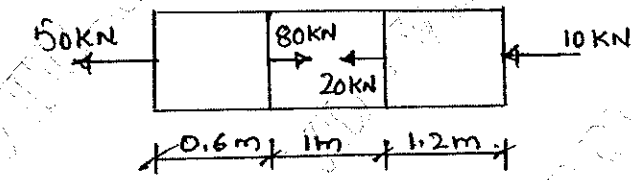
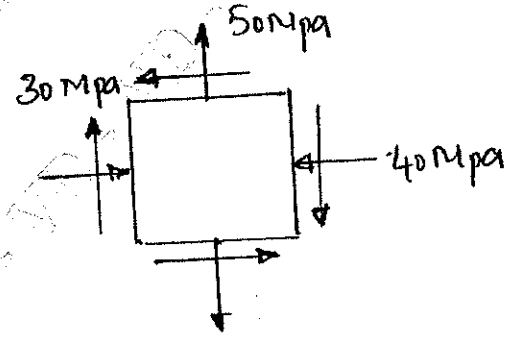
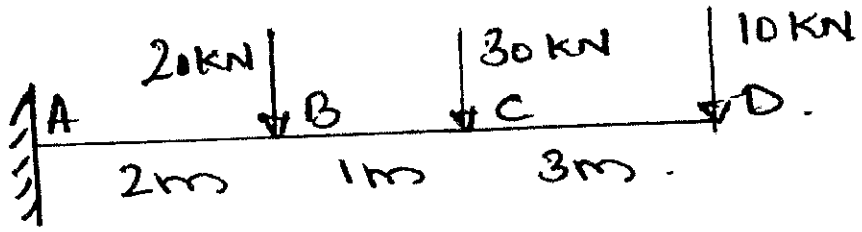
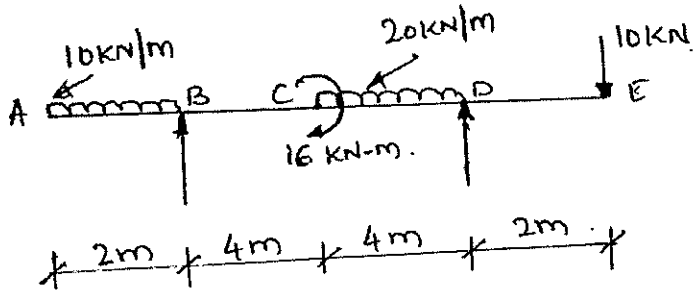
BME301

Thrid Semester B.E./B.Tech. Degree Examination, June/July 2025
Mechanics of Materials

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	**a.**	Define the following : i) Stress ii) Strain iii) Possion's ratio iv) Volumetric strain v) Bulk Modulus	**5**	**L1**	**CO1**
	b.	With a neat diagram, explain the salient points in stress- strain curve of mild steel material.	**5**	**L2**	**CO1**
	c.	A brass bar having cross sectional area of 1000 mm^2 is subjected to axial forces as shown in Fig Q1(c). Find the total elongation of the bar. Take E = 100 GPa.  Fig Q1(c)	**10**	**L1/3**	**CO1**
		OR			
Q.2	**a.**	Establish the relationship between Young's Modulus and Modulus of Rigidity.	**10**	**L2**	**CO1**
	b.	A steel rod of 30 mm diameter is enclosed centrally in a hollow copper tube of external diameter 50 mm and internal diameter 40 mm. The composite bar is subjected to axial pull of 45 kN, if the length of the each bar is equal to 190 mm. Find : i) Stress in rod and hollow tube ii) Load carried by each member iii) Deformation	**10**	**L1/3**	**CO1**
		Module – 2			
Q.3	**a.**	Define the following : i) Plane stress ii) Principle plane and Principle stress.	**5**	**L1**	**CO2**
	b.	An element is subjected to state of stress as shown in Fig Q3(b). Determine principle stresses and its direction Max. shear stress and its direction. Also verify using Mohr's circle method.  Fig Q3(b)	**15**	**L3**	**CO2**

		OR			
Q.4	**a.**	Derive an expression for stresses in thin cylinder.	**10**	**L2**	**CO2**
	b.	A cylindrical pressure vessel has inner and outer radii of 200 mm and 250 mm respectively. The material of the cylinder has allowable stress of 75 MPa. Determine the maximum internal pressure that can be applied and draw a sketch of radial pressure and circumferential stress distribution.	**10**	**L3**	**CO2**
		Module – 3			
Q.5	**a.**	List the different types of Beams and Loads.	**5**	**L1**	**CO3**
	b.	Derive the relationship between load intensity, shear force and bending moment.	**5**	**L2**	**CO3**
	c.	Draw the shear force and bending moment diagram for the beam shown in Fig Q5(c).  Fig Q5(c)	**10**	**L3**	**CO3**
		OR			
Q.6		For the beam shown in Fig Q6. Draw the shear force and bending moment diagram. Locate the point of contra – flexure if any.  Fig Q6	**20**	**L3**	**CO3**
		Module – 4			
Q.7	**a.**	List the assumptions made in theory of pure bending.	**5**	**L1**	**CO4**
	b.	Establish the relation between Bending stress and Radius of curvature.	**5**	**L2**	**CO4**
	c.	A 2 cm long beam with rectangular section (100 mm × 50 mm) is simply supported at its ends and is subjected to point load 10 kN at its midspan. Draw a sketch showing bending stress distribution along with depth of the section under maximum bending moment.	**10**	**L3**	**CO4**

		OR			
Q.8	**a.**	Show that the maximum shear stress in rectangular section is 1.5 times average shear stress.	**10**	**L2**	**CO4**
	b.	An 'I' section of a beam has equal flanges of each (120 mm × 10 mm) and web of size (200 mm × 10 mm) when the section is subjected to a shear force of 50 kN. Draw a sketch showing shear stress distribution.	**10**	**L3**	**CO4**
		Module – 5			
Q.9	**a.**	Derive Torsion Equation with usual notation.	**10**	**L2**	**CO5**
	b.	A shaft transmits 180 kW at 240 rpm. The allowable shear stress is 72 MPa. Find the diameter of solid shaft. Also, find the diameter of the hollow shaft if, the inside diameter is 0.6 times the outside diameter. What is the percentage of saving in material if, both shaft are made of same material and same length.	**10**	**L3**	**CO5**
		OR			
Q.10	**a.**	Derive Euler's Equation for long column having both ends hinged.	**10**	**L2**	**CO5**
	b.	A 2 m long column has a square cross section of side 40 mm. Taking FoS as 4. Find the safe load for the following condition. i) Both ends hinged ii) One end fix other end free iii) Both ends fixed iv) One end fix other end hinged	**10**	**L3**	**CO5**

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BME302

Third Semester B.E./B.Tech. Degree Examination, June/July 2025
Manufacturing Process

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	What is Pattern? Explain the following patterns used in sand casting. i) Split pattern ii) Match plate pattern iii) Sweep pattern	10	L2	CO1
	b.	Sketch and Explain Jolt type moulding machine.	10	L2	CO1
		OR			
Q.2	a.	Illustrate the different steps involved in shell moulding process.	10	L2	CO1
	b.	Explain how to determine the amount of clay present in the foundry sand.	10	L2	CO1
		Module – 2			
Q.3	a.	Explain with neat sketch the construction and working of direct arc electric furnace.	10	L2	CO2
	b.	With a neat sketch, explain resistance furnace.	10	L2	CO2
		OR			
Q.4	a.	What is die casting? With a neat sketch explain hot chamber die casting process.	10	L2	CO2
	b.	With a neat sketch explain semi-centrifugal casting process.	10	L2	CO2
		Module – 3			
Q.5	a.	Distinguish between hot working and cold working process.	10	L4	CO3
	b.	Derive an expression for wire drawing load by slab analysis.	10	L3	CO1
		OR			
Q.6	a.	Explain bending operations with suitable sketches.	10	L2	CO3
	b.	With neat sketches, explain combination die and progressive die.	10	L2	CO3
		Module – 4			
Q.7	a.	With a neat sketch, Explain Gas Tungsten Arc Welding (GTAW) Process.	10	L2	CO4
	b.	Distinguish between GAS Metal Arc Welding (GMAW) and Gas Tungsten Arc Welding (GTAW).	10	L1	CO4
		OR			
Q.8	a.	Explain submerged Arc Welding (SAW) process with a neat sketch.	10	L2	CO4
	b.	Analyze the types of flames that can be obtained during oxy-acetalene welding process.	10	L2	CO4
		Module – 5			
Q.9	a.	Explain the following weld defects with neat sketches. i) Inclusion ii) Over penetration iii) Porosity iv) Undercut v) Spatter	10	L2	CO5
	b.	Write a note on Heat Affected Zone (HAZ) in welding with neat sketch.	10	L1	CO5
		OR			
Q.10	a.	Define soldering. Explain soldering iron process with a neat sketch.	10	L2	CO5
	b.	With a neat sketch. Explain friction stir welding process.	10	L2	CO1

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BME303

Third Semester B.E./B.Tech. Degree Examination, June/July 2025

Material Science and Engineering

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M: Marks, L: Bloom's level, C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain classification of materials. Compare crystalline solids and non crystalline solids.	10	L2	CO1
	b.	Define (i) Crystal lattice (ii) Unit cell (iii) Planar atomic density (iv) Coordination number (v) Atomic packing factor.	10	L1	CO1
		OR			
Q.2	a.	Derive atomic packing factor for simple cubic structure.	10	L2	CO1
	b.	Explain edge and screw dislocations.	10	L2	CO1
		Module – 2			
Q.3	a.	State and explain HumeRothery rules.	10	L1	CO2
	b.	Explain Fick's laws of diffusion.	10	L2	CO2
		OR			
Q.4	a.	Explain iron-carbon diagram with a sketch.	10	L2	CO2
	b.	Two metals A and B are used to form an alloy containing 75% A and 25% B. A melts at 650°c and B at 450°c. The solid solubility of metal A is B and of B is A are negligible. The metal pair forms an eutectic at 40% A and 60% B which solidifies at 300°c. Assume liquids and solidus lines are straight draw phase diagram for the alloy series.	10	L3	CO2
		Module – 3			
Q.5	a.	Explain (i) Annealing (ii) Normalizing (iii) Hardening (iv) Tempering (v) Nitriding.	10	L1	CO3
	b.	Explain with sketch Joming End Quench test.	10	L2	CO3
		OR			
Q.6	a.	Explain with a neat sketch flame hardening.	10	L2	CO3
	b.	Explain with a graph T-T-T diagram.	10	L2	CO3
		Module – 4			
Q.7	a.	With a neat sketch explain physical vapours deposition.	10	L2	CO4
	b.	Write advantages and disadvantages of surface coating.	10	L2	CO4
		OR			
Q.8	a.	Explain different powder production techniques in mechanical methods.	10	L2	CO4
	b.	Explain the functions of lubricants and binders in powder metallurgy.	10	L2	CO4
		Module – 5			
Q.9	a.	State properties, composition and uses of low, medium and high carbon steels.	10	L2	CO5
	b.	Explain with sketch hand-layup process.	10	L2	CO5
		OR			
Q.10	a.	Briefly explain the selection criteria for selection of materials.	10	L2	CO5
	b.	With a sketch explain filament winding process.	10	L2	CO5

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BME306B

Third Semester B.E/B.Tech. Degree Examination, June/July 2025
Smart Materials and Systems

Time: 3 hrs. Max. Marks:100

Note: *1. Answer any FIVE full questions, choosing ONE full question from each module.*
2. M : Marks , L: Bloom's level , C: Course outcomes.
3. Write neat sketches wherever required.

		Module – 1	M	L	C
1	a.	Define System Intelligence. Explain briefly the components of smart structures.	10	L2	CO1
	b.	Explain briefly the classification of the smart structures.	10	L1	CO1
		OR			
2	a.	Explain briefly the various examples of stimulus responsive smart materials.	10	L3	CO1
	b.	Enumerate the functions of smart structures and their application area in the various fields.	10	L2	CO1
		Module – 2			
3	a.	Explain the principle of piezoelectricity with their characteristics.	10	L3	CO2
	b.	Explain briefly the following : i) Piezo ceramics ii) Ferro electricity.	10	L2	CO2
		OR			
4	a.	Explain the usage of the piezoelectric materials as sensors and actuators.	10	L2	CO2
	b.	Explain briefly the following : i) Piezo polymers ii) Piezo resistivity.	10	L2	CO2
		Module – 3			
5	a.	What are shape memory alloys? Explain briefly the classification of the Shape Memory Alloys.	10	L1	CO2
	b.	Explain briefly the characteristics and features of Ni – Ti Shape Memory Alloys.	10	L2	CO3
		OR			
6	a.	Explain the two way Shape Memory effect with schematic diagram.	10	L3	CO3
	b.	Explain briefly functional properties of the Shape Memory Alloys.	10	L2	CO2

		Module – 4			
7	a.	Explain briefly the various properties of smart polymer.	**10**	**L2**	**CO3**
	b.	Explain briefly the various types of Electro active polymers.	**10**	**L2**	**CO2**
		OR			
8	a.	What are pH – responsive smart materials? Enumerate the key features and examples of pH – responsive smart materials.	**10**	**L2**	**CO3**
	b.	Explain briefly how the smart polymers are used in drug delivery.	**10**	**L3**	**CO3**
		Module – 5			
9	Explain the following :				
	a.	Self healing materials.	**10**	**L2**	**CO3**
	b.	Smart Corrosion protection coating.	**10**	**L2**	**CO3**
		OR			
10	Explain the following :				
	a.	Elastic Memory composites.	**10**	**L3**	**CO3**
	b.	Smart Materials for space applications.	**10**	**L2**	**CO3**

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