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BME515D

Fifth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Energy 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.	With a neat sketch, explain the working principle of Benson Boiler.	10	L2	CO1
	b.	With a neat sketch, explain forced draught and induced draught cooling towers.	10	L2	CO1
		OR			
Q.2	a.	With a neat diagram , explain the general layout of diesel power plants.	10	L2	CO1
	b.	Explain the different methods of starting diesel engines.	6	L2	CO1
	c.	Write any 4 applications of diesel power plants.	4	L1	CO1
		Module – 2			
Q.3	a.	With a neat sketch, explain Pyranometers.	6	L2	CO2
	b.	With a neat sketch, explain the flat plate collectors.	6	L2	CO2
	c.	With a neat diagram, explain the electric power generation from solar ponds.	8	L2	CO2
		OR			
Q.4	a.	Write the difference between Biomass and Biogas.	5	L4	CO3
	b.	Explain the working of down draft gasifier, with neat sketch.	10	L2	CO3
	c.	What are the factors affecting biogas generation.	5	L1	CO3
		Module – 3			
Q.5	a.	Explain the advantages and disadvantages of Tidal plants.	10	L1	CO3
	b.	Explain the Hot dry rock energy system, with a neat sketch.	10	L2	CO3
		OR			
Q.6	a.	Explain the working of Horizontal axis wind mill.	10	L2	CO3
	b.	List the advantages and disadvantages of wind energy.	10	L1	CO3

		Module – 4			
Q.7	**a.**	With a neat sketch, explain the general layout of a hydel power plant.	**10**	**L2**	**CO3**
	b.	Write a note on : i) Hydrographs ii) Flow duration curves iii) Spill ways iv) Surge tank v) Water hammer	**10**	**L1**	**CO3**
		OR			
Q.8	**a.**	List the advantages of hydel power plants.	**5**	**L1**	**CO3**
	b.	What are the problems encountered in harnessing OTE?	**7**	**L1**	**CO3**
	c.	Explain the working of Rankine cycle in OTEC system.	**8**	**L2**	**CO3**
		Module – 5			
Q.9	**a.**	Write the advantages and disadvantages of nuclear power plants.	**10**	**L1**	**CO3**
	b.	Explain the layout of a nuclear power plant.	**10**	**L2**	**CO3**
		OR			
Q.10	**a.**	With a neat sketch, explain boiling water reactor.	**10**	**L2**	**CO3**
	b.	Write a note on : i) Structure of an atom ii) Disposal of nuclear wastes.	**10**	**L1**	**CO3**

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17/12/2025

CBCS SCHEME

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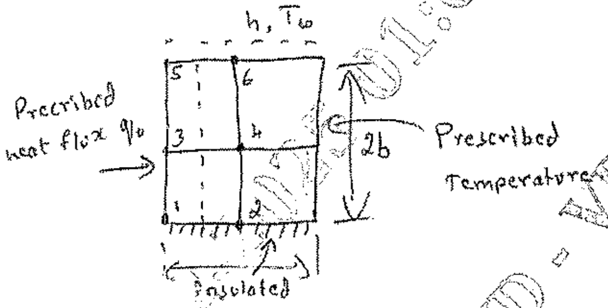
BME601

Sixth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Heat Transfer

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. Use of Heat and Mass transfer Data book are permitted.

		Module – 1	M	L	C
Q.1	a.	Derive an expression for Temperature distribution and rate of heat transfer through plane wall.	10	L3	CO1
	b.	Explain different boundary conditions as applicable to heat transfer analysis.	10	L2	CO1
		OR			
Q.2	a.	Explain the experimental method of determining the thermal conductivity of a metal rod.	10	L2	CO1
	b.	The wall of a house in cold region consists of three layers, an outer brick work 15 cm thick, the inner wooden panel 1.2 cm thick, the intermediate layer is insulator of 7 cm thick. The K for brick and wood are 0.7 and 0.18 W/mK. The inside and outside temperature of wall are 21 and $-15^{\circ}C$. If insulation layer offer twice the thermal resistance of the brick wall, calculate, (i) Heat loss per unit area. (ii) 'K' of insulator.	10	L3	CO1
		Module – 2			
Q.3	a.	Derive an expression for the temperature distribution for a long fin of uniform cross section with insulated tip.	10	L3	CO3
	b.	A rod (K = 200 W/mK) 5 mm in diameter and 5 cm long has its one end maintained at 100°C. The surface of the rod is exposed to ambient air at 25°C with convection heat transfer co-efficient of 100 W/m^2K. Assuming the other end is insulated. Determine (i) the temperature of rod at 20 mm distance from the end at 100°C (ii) Heat dissipation rate from the surface of rod (iii) Effectiveness.	10	L3	CO3
		OR			
Q.4	a.	Obtain an expression for temperature distribution of solid in lumped heat transfer analysis in dimensional numbers.	10	L3	CO3
	b.	A 15 mm diameter mild steel sphere of K = 42 W/m°C is exposed to cooling air flow at 20°C with h = 120 $W/m^2{}^{\circ}C$. Determine the following : (i) Time required to cool from 550°C to 90°C. (ii) Instantaneous heat transfer rate 2 minutes after start of cooling.	10	L3	CO3

		Module – 3			
Q.5	**a.**	Explain the formulation of differential equation 1-D steady state heat conduction.	**10**	**L2**	**CO3**
	b.	Consider steady state heat conduction in a square region of side 2b, in which energy is generated at a constant rate of g w/m^3. The boundary conditions for the problem are shown in Fig. Q5 (b). Write the finite difference equations for nodes 1, 3 and 5 in this Fig. Q5 (b).  Fig. Q5 (b)	**10**	**L3**	**CO3**
		OR			
Q.6	**a.**	State and explain the following laws of radiation : (i) Steafan Boltzman law (ii) Kirchoff's law (iii) Planck's law (iv) Wein's displacement law (v) Lambert's cosine law	**10**	**L2**	**CO3**
	b.	Calculate the net radiant heat exchange per unit area for two large parallel plates at a temperature of 427°C and 27°C respectively. $\in_{hot\ plate} = 0.9$, $\in_{cold\ plate} = 0.6$. If a polished alluminium shield is placed between them. Find the percentage reduction in the heat transfer $\in_{shield} = 0.04$.	**10**	**L3**	**CO3**
		Module – 4			
Q.7	**a.**	Explain with sketch : (i) Velocity Boundary layer (ii) Thermal Boundary layer	**10**	**L2**	**CO2**
	b.	Air at a temperature of 20°C flows through a rectangular duct with a velocity of 10 m/s. The duct is $30cm \times 20cm$ in size and air leaves at 34°C. Find the heat gain by air when it is passed through 10 m long.	**10**	**L3**	**CO2**
		OR			
Q.8	**a.**	Explain the physical significance of, (i) Reynolds number (ii) Prandtl number (iii) Nusselt number (iv) Grashoff's number (v) Stanton number	**10**	**L2**	**CO2**
	b.	Considering the body of a man as a vertical cylinder of 300 mm diameter and 170 cm height. Calculate the heat generated by the body in one day. Take the body temperature as 36°C and ambient temperature as 14°C.	**10**	**L3**	**CO2**

		Module – 5			
Q.9	**a.**	Derive an expression for LMTD for a parallel flow heat exchanger.	**10**	**L3**	**CO4**
	b.	An oil cooler for a large diesel engine is to cool engine oil from 60°C to 45°C using sea water at an inlet temperature of 20°C with a temperature raise of 15°C. The design heat load is 140 kW and the mean overall heat transfer coefficient based on the outer surface area of the tube is 70 W/m^2°C. Calculate the heat transfer surface area for single pass counter flow and parallel flow arrangements.	**10**	**L3**	**CO4**
		OR			
Q.10	**a.**	Explain with a neat sketch the Regimes of pool Boiling process.	**10**	**L2**	**CO4**
	b.	A vertical plate 30 cm ×30 cm is exposed to steam at atmospheric pressure. The plate temperature is 98°C. Calculate the heat transfer and the mass of steam condensed per hour.	**10**	**L2**	**CO4**

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CBCS SCHEME

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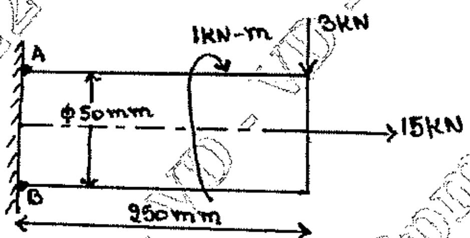
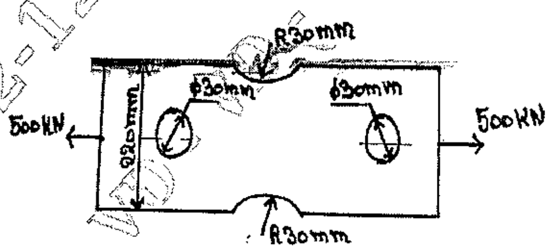
Sixth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Machine Design

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. Use of Design Data Hand Book is permitted.

		Module – 1	M	L	C
Q.1	a.	Explain the factors which influence the selection of engineering materials?	5	L2	CO1
	b.	Explain Codes and Standards.	5	L2	CO1
	c.	A circular rod of diameter 50 mm is subjected to an axial, bending and torsional loads as shown in Fig Q1(c). Determine the nature and magnitude of stresses at the critical points.  Fig Q1(c)	10	L3	CO1
		OR			
Q.2	a.	Define Stress concentration and discuss any two methods of reducing stress concentration.	6	L1	CO1
	b.	Explain the following theories of failure i) Maximum Normal Stress Theory ii) Maximum Shear Stress Theory iii) Distortion Energy Theory	6	L2	CO1
	c.	A bar of rectangular section is subjected to an axial pull of 500 kN as shown in Fig Q2(c). Determine the thickness of the plate, if the allowable tensile stress is 200 MPa.  Fig Q2(c)	8	L3	CO1

		Module – 2			
Q.3	a.	A shaft is supported by two bearings placed in apart. A 500 mm diameter pulley is mounted at a distance of 200 mm to the right of left hand bearing and this drives a pulley directly below it with the help of belt having maximum tension of 3000N. The pulley weight 1000N. Another pulley 300 mm diameter is placed 300 mm to the left of right hand bearing is driven with the help of electric motor and the belt which is placed horizontally to the right when viewed from the left bearing. This pulley weight 500N. The angle of contact for both the pulleys is 180° and $\mu = 0.24$. Determine suitable diameter of solid shaft, assuming torque on one pulley is equal to torque on other pulley. Choose C15 steel ($\sigma_y = 235.4$ MPa, $\sigma_u = 425$ MPa) as the shaft material and use ASME code for the design of shaft. Assume minor shock condition.	20	L3	CO3
		OR			
Q.4	a.	Prove that a square key is equally strong in shear and compression.	5	L3	CO3
	b.	Design a flange coupling to connect the shafts of a motor and centrifugal pump for the following specification pump output = 3000 liters/minute, Total head = 20 m, Pump speed = 600 rpm, Pump efficiency = 70%, Select C-40 steel ($\sigma_y = 328.6$ MPa) for shaft and C-35 steel ($\sigma_y = 304$ MPa) for bolts with factor of safely 2. Use allowable shear stress in cast iron flanges equal to 15 N/mm^2.	15	L3	CO3
		Module – 3			
Q.5	a.	Design a triple riveted Lap Joint with zig-zag riveting, for a pressure vessel of 1.5 m diameter. The maximum pressure inside vessel is 1.5 MPa. The allowable stresses in tension, crushing and shear are 100 MPa, 125 MPa and 75 MPa respectively. Take efficiency as 75%.	10	L3	CO3
	b.	A plate of 80 mm wide and 10 mm thick is to be collected to another plate by means of two parallel fillet welds. The plates are subjected to an axial load of 50kN. Find the length of the weld so that maximum stress does not exceed 50 N/mm^2. Consider the joint under static loading and then under dynamic loading.	10	L3	CO3
		OR			
Q.6	a.	A pair of carefully cut spur gears with 20° full depth involute profile is used to transmit 12 kW at 1200 rpm of pinion. The gear has to rotate at 300 rpm. The material used for both pinion and gear is medium. Carbon steel having allowable stress of 230 MPa. Design the gear completely. Take Number of teeth on pinion as 24.	20	L3	CO4
		Module – 4			
Q.7	a.	Design a pair of bevel gears to transmit 12kW at 300 rpm of gear and 1470 rpm of the pinion. The angle between the shaft axes is 90°. The pinion has 20 teeth and the material for both pinion and gear is cast steel having allowable stress of 188.33 MPa. Take service factor as 1.25. Suggest suitable surface hardness for the gear pair.	20	L3	CO4

		OR			
Q.8		Complete the design and determine the input capacity of a worm gear speed reducer unit which consists of a hardened steel worm and a phosphor bronze gear having 20° stub involute teeth. The center distance is to be 200 mm and transmission ratio is 10 and the worm speed is 2000 rpm.	**20**	**L3**	**CO4**
		Module – 5			
Q.9	**a.**	In a machine the radial width of the friction material is 0.2 times the maximum radius. Take coefficient of friction as 0.25, maximum diameter of the clutch is 250 mm, axial force is 600 N, power is 60 kW and the speed is 3000 rpm. Find how many discs are required, also find the pressure at the contact surface.	**10**	**L3**	**CO3**
	b.	A simple band brake operates on 600 mm diameter brake down, running at 200 rpm and has a contact angle of 270°. The coefficient of friction is 0.25, one end of the band is connected to a pin and the other end at a distance of 125mm from the pin and 625 mm from the free end of the lever, where the operating force is applied. Find the maximum pull required, if 50 kW power is absorbed and what is the direction of minimum pull, if the maximum tensile stress in the band is limited to 50 MPa. Find width and thickness of the band. Also design the lever if depth is 2 times the width of the lever.	**10**	**L3**	**CO3**
		OR			
Q.10	**a.**	Derive Petroff's equation for coefficient of friction. Also state the assumption made.	**10**	**L3**	**CO5**
	b.	A turbine shaft 60 mm in diameter, rotates at a speed of 1000 rpm. The load on each bearing is estimated at 2 kN and the length of the bearing is 80 mm. Taking radial clearance as 0.05 mm and SAE – 20 oil for lubrication. Determine the coefficient of friction by Mckee's equation, power loss, minimum oil film thickness and the oil flow rate. The temperature of the bearing is not to exceed 50°C.	**10**	**L3**	**CO5**

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CBCS SCHEME

USN 2VD22ME007

BME613A

Sixth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Total Quality Management

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 TQM? Explain the six basic concept of TQM.	10	L2	CO1
	b.	Elucidate the obstacles associated with the implementation of TQM.	10	L3	CO1
		OR			
Q.2	a.	Elaborate on the change in culture required to implement TQM.	10	L3	CO1
	b.	Explain, briefly all eight ISO 9001 requirement.	10	L2	CO1
		Module – 2			
Q.3	a.	List out Deming's 14 points of TQM philosophy and explain any three.	10	L2	CO2
	b.	Define Ethics. Explain the root causes of unethical behavior.	10	L2	CO2
		OR			
Q.4	a.	Explain role of TQM leader.	10	L2	CO2
	b.	Explain the seven steps strategic planning.	10	L2	CO2
		Module – 3			
Q.5	a.	With a neat sketch enumerate how a KANO model help in translating needs into requirements.	10	L3	CO3
	b.	Describe Motivation, Performance, reward, recognition and empowerment.	10	L2	CO3
		OR			
Q.6	a.	State and explain elements of customer service.	10	L2	CO3
	b.	Elucidate on customer perception of quality.	10	L3	CO3
		Module – 4			
Q.7	a.	Sketch and explain Juran's Triology.	10	L2	CO4
	b.	Illustrate with neat diagram PDSA cycle for continuous improvement with an example.	10	L3	CO4
		OR			
Q.8	a.	Explain with a neat sketch i) Cause and effect diagram ii) Pareto diagram.	10	L2	CO4
	b.	Explain various measures of central tendency, measure of dispersion and control charts.	10	L2	CO4
		Module – 5			
Q.9	a.	Define Total Productive Maintenance and explain briefly its 8 pillars.	10	L2	CO5
	b.	Explain the steps in TPM implementation.	10	L2	CO5
		OR			
Q.10	a.	Define Quality by Design and explain its key components.	10	L2	CO5
	b.	Explain the concept of environment management system under ISO14001.	10	L3	CO5

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14/01/2026

CBCS SCHEME

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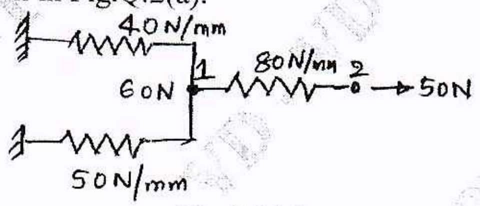
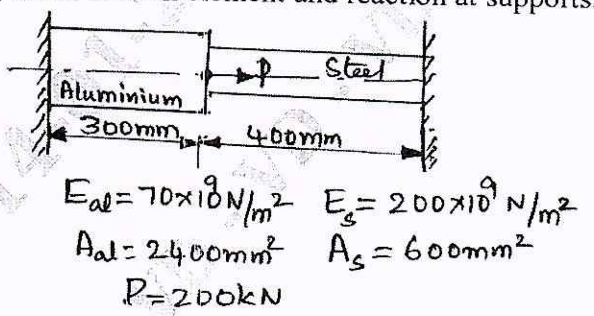
BME701

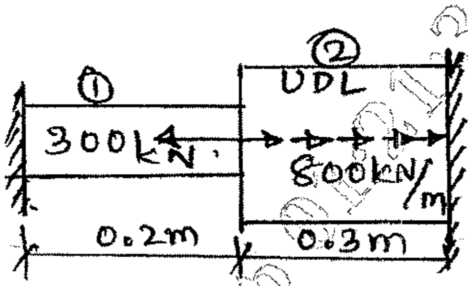
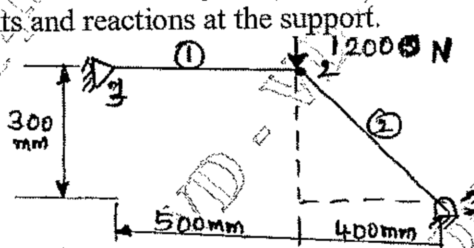
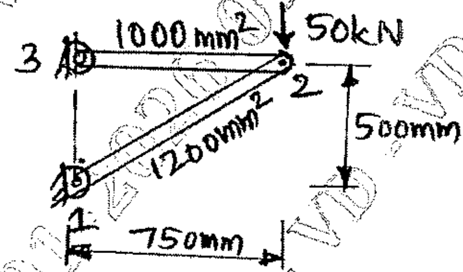
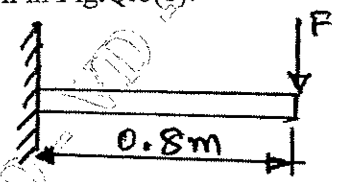
Seventh Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Finite Element Methods

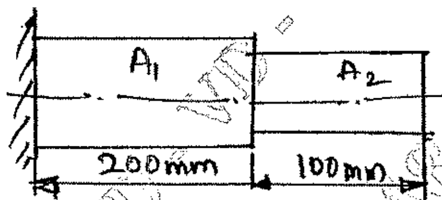
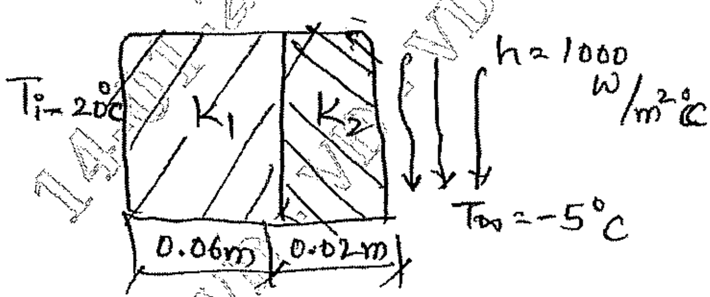
Time: 3 hrs.

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 FEM. Explain the basic steps in the finite element methods.	**10**	**L2**	**CO1**
	b.	Explain the plane stress and plane strain problems with examples, write the relation between stress and strain.	**10**	**L2**	**CO1**
		OR			
Q.2	**a.**	Using minimum potential energy determine the nodal displacement of a spring system shown in Fig.Q.2(a).  Fig.Q.2(a)	**8**	**L3**	**CO1 CO2**
	b.	A simply supported beam subjected to point load at the centre. Derive an equation for maximum deflection using trigonometric function by Rayleigh Ritz method.	**12**	**L3**	**CO1 CO2**
		Module – 2			
Q.3	**a.**	Derive shape functions (interpolation polynomial) for a 1-D bar element in natural coordinates.	**8**	**L2**	**CO3**
	b.	For the stepped bar shown in Fig.Q.3(b). Determine the nodal displacements, stress in each element and reaction at supports.  Fig.Q.3(b)	**12**	**L3**	**CO4 CO5**
		OR			
Q.4	**a.**	Derive element stiffness matrix of a 1-D bar element. List the properties of stiffness matrix.	**10**	**L2**	**CO3**

			Marks	Level	CO
	b.	Find the nodal displacements, stress and reaction for the bar subjected to load as shown in Fig.Q.4(b). Take $E_1 = 70$ GPa, $E_2 = 200$ GPa.  $A_1 = 7.85 \times 10^{-8} m^2$ $A_2 = 3.14 \times 10^{-7} m^2$ Fig.Q.4(b)	10	L3	CO4 CO5
		Module – 3			
Q.5	a.	For the two-bar truss shown in Fig.Q.5(a) determine the displacements stress in each elements and reactions at the support.  $E = 2\times10^5 N/mm^2$ $A = 200 mm^2$ Fig.Q.5(a)	10	L3	CO4 CO5
	b.	For the two bar truss shown in Fig.Q.5(b). Determine the nodal displacements and stress in each member. Also find support reaction. Take E = 200GPa  Fig.Q.5(b)	10	L3	CO4 CO5
		OR			
Q.6	a.	Derive Hermite shape function for a beam element.	10	L2	CO3
	b.	Find the deflection at the free end and the support reaction of a cantilever beam shown in Fig.Q.6(b).  $F = 250kN$ $E = 200GPa$ $I = 4\times10^{-6} m^4$ Fig.Q.6(b)	10	L3	CO4 CO5

		Module – 4			
Q.7	**a.**	Derive shape functions of Constant Strain Triangular (CST) element in natural coordinates.	**10**	**L2**	**CO3**
	b.	Obtain the shape functions of 4 noded rectangular (quadrilateral) element in Lagrangian-in natural coordinates.	**10**	**L2**	**CO3**
		OR			
Q.8	**a.**	Explain the concept of isoparametric, sub parametric, super parametric elements, with sketches.	**10**	**L2**	**CO2**
	b.	Obtain the shape functions of nine (9) noded rectangular element in Lagrangian.	**10**	**L2**	**CO3**
		Module – 5			
Q.9	**a.**	Derive an expression of element mass matrix for a bar element.	**6**	**L2**	**CO3**
	b.	For the stepped bar shown in Fig.Q.9(b) determine the eigen values and eigen vector. Take A_1 = 400 mm^2, A_2 = 200 mm^2, ρ = 7850 kg/m^3, E = 200 GPa.  Fig.Q.9(b)	**14**	**L3**	**CO4** **CO5**
		OR			
Q.10	**a.**	Briefly describe rate equations and boundary conditions in heat transfer analysis.	**6**	**L2**	**CO2**
	b.	Determine the temperature distribution through composite wall shown in Fig.Q.10(b), when the convective heat loss occurs on the right surface. Take K_1 = 6 W/m°C, and K_2 = 20 W/m°C.  Fig.Q.10(b)	**14**	**L3**	**CO4** **CO5**

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CBCS SCHEME

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BME702

Seventh Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Hydraulics and Pneumatics

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 fluid power system and explain the structure of basic hydraulic system with a block diagram.	10	L1	CO1
	b.	List and explain the difference between hydraulics and pneumatics focusing on the advantages, disadvantages and applications.	10	L1	CO1
		OR			
Q.2	a.	Define hydraulic fluid and explain the necessary properties of a good hydraulic fluid.	10	L2	CO1
	b.	Identify and describe various filter locations in a hydraulic system with a neat sketch.	10	L2	CO1
		Module – 2			
Q.3	a.	Classify fixed displacement pumps.	5	L2	CO2
	b.	Describe the pumping theory of positive displacement pumps.	5	L2	CO2
	c.	With a neat sketch, explain the working of an unbalanced vane pump.	10	L2	CO2
		OR			
Q.4	a.	Explain the working of single-acting and double acting hydraulic cylinder with neat sketch.	10	L3	CO2
	b.	Write short notes on : i) Cylinder cushioning ii) Accumulator	10	L2	CO2
		Module – 3			
Q.5	a.	With a neat sketch, explain the working of a 4/3 solenoid – operated Directional Control Valve (DCV).	10	L3	CO3
	b.	With a neat sketch, explain the functions and applications of shuttle valve. Also, mention the truth table of the same.	10	L2	CO3
		OR			
Q.6	a.	With a neat sketch, explain the working of meter – in hydraulic circuit. Mention its advantages and applications.	10	L3	CO3
	b.	With a neat hydraulic circuit, explain the working and applications of a regenerative circuit.	10	L3	CO3

Module – 4					
Q.7	**a.**	With a block diagram, explain the working of a pneumatic control system.	**10**	**L2**	**CO4**
	b.	Write short notes on : i) Characteristics of compressed air ii) FRL unit	**10**	**L2**	**CO4**
OR					
Q.8	**a.**	With a neat circuit diagram, explain the working and applications of a quick exhaust valve.	**10**	**L3**	**CO4**
	b.	Write short notes on : i) Rod-less pneumatic cylinder ii) Mounting methods in pneumatic	**10**	**L2**	**CO4**
Module – 5					
Q.9	**a.**	Explain two types of throttling methods in pneumatic systems. Also mention their advantages and applications.	**10**	**L2**	**CO5**
	b.	Explain the direct and indirect actuation methods using neat pneumatic circuits.	**10**	**L3**	**CO5**
OR					
Q.10	**a.**	Construct and explain a pneumatic circuit to achieve the sequence $A^+ B^+ B^- A^-$ of the pneumatic cylinders. Mention its applications.	**10**	**L3**	**CO5**
	b.	Write short notes on : i) Time delay valve ii) Signal overlapping in pneumatics	**10**	**L2**	**CO5**

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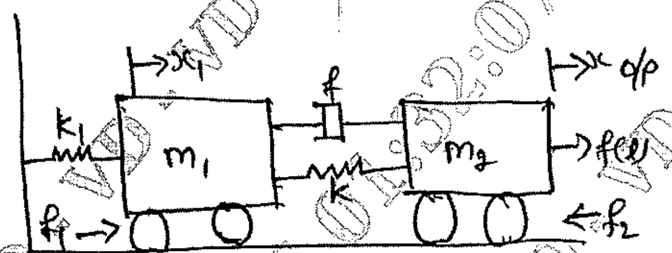
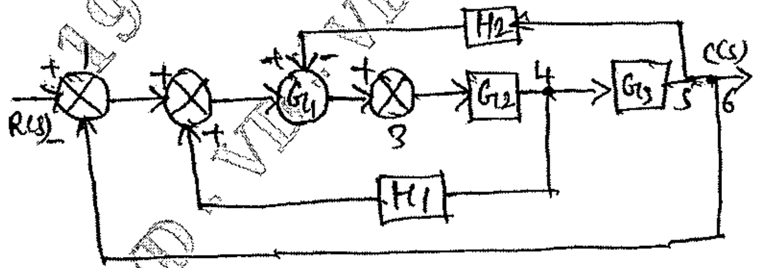
CBCS SCHEME

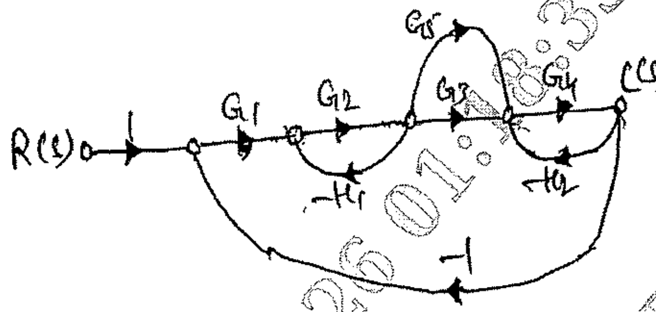
USN | | | | | | | | | | | **BME703**

Seventh Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Control 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.	Define Control System. List out the comparison between open loop and closed loop control system.	6	L1	CO1
	b.	Elaborate the concept of feedback control system with an example.	6	L1	CO1
	c.	Describe the requirements of an ideal control system.	8	L1	CO1
		OR			
Q.2	a.	Explain proportional plus integral controller action with the characteristics.	10	L1	CO1
	b.	Obtain the transfer function of the mechanical system shown in Fig.Q.2(b) writing the physical system equations.  Fig.Q.2(b)	10	L2	CO1
		Module – 2			
Q.3	a.	For the system shown in Fig.Q.3(a), use block diagram reduction technique to find $\frac{C}{R}$ equation.  Fig.Q.3(a)	10	L2	CO1

	b.	Find the overall transfer function by using Mason's gain formula for the signal flow graph shown in Fig.Q.3(b).  Fig.Q.3(b)	10	L3	CO2
		OR			
Q.4	a.	Explain in detail the types of system compensation with a neat sketch.	10	L3	CO2
	b.	Explain the following: i) Lag compensator ii) Lead compensator	10	L3	CO2
		Module – 3			
Q.5	a.	Elaborate the following terms with graph and equations: i) Step ii) Ramp input iii) Parabolic input iv) Impulse input	10	L2	CO3
	b.	Derive the expression for error constant and steady state errors and also define the steady state error.	10	L3	CO3
		OR			
Q.6	a.	Derive the expression for transient response of second order system for unit step input.	10	L2	CO5
	b.	For with feedback control system having open-loop transfer function: $G(s)=\frac{K(s+2)}{s(s^3+7s^2+12s)}$ Find: i) Type of system ii) Error coefficients iii) Steady state error for input of $\frac{R}{2}t^2$	10	L2	CO3
		Module – 4			
Q.7	a.	The characteristics equation of a system is given by $s^6+3s^5+4s^4+6s^3+5s^2+3s+2=0$ Determine the stability using RH criteria.	8	L2	CO4

			Marks	Level	CO
	b.	By applying Routh criterion, discuss the stability of the closed loop system as a function of K for the following open loop transfer function. $G(s)H(s)=\frac{k(s+1)}{s(s-1)(s^2+4s+16)}$	12	L2	CO4
		OR			
Q.8		The loop transfer function of a unity feedback control system is $G(s)=\frac{k(s+6)}{s(s+1)(s+2)}$ Draw the root locus diagram for all values of K ranging from 0 to ∞ and mark the salient points on the root locus.	20	L2	CO4
		Module – 5			
Q.9	a.	Sketch the polar plot for the transfer function $G(s)=\frac{1}{(1+s)(1+2s)}$	6	L2	CO4
	b.	Using Nyquist criterion, investigate the stability of a system whose open loop transfer function is $G(s)H(s)=\frac{K}{(s+1)(s+2)(s+3)}$	14	L2	CO4
		OR			
Q.10		Construct the bode plot for a unity feedback system whose open loop transfer function is given by: $G(s)H(s)=\frac{10}{s(1+s)(1+0.02s)}$ From Bode plot determine: i) Gain and phase cross over frequencies ii) Gain and phase margin iii) Stability of the closed loop system	20	L2	CO4

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CBCS SCHEME

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BME714A

Seventh Semester B.E/B.Tech. Degree Examination, Dec.2025/Jan.2026

Additive Manufacturing

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.

			M	L	C
		Module – 1	**M**	**L**	**C**
1	a.	Define additive manufacturing and list its advantages over conventional manufacturing.	5	L1	CO1
	b.	Distinguish between additive manufacturing and CNC machining.	5	L2	CO1
	c.	Illustrate the generic additive manufacturing process chain with a neat sketch.	10	L3	CO1
		OR			
2	a.	Describe the role of reverse engineering in additive manufacturing.	5	L1	CO1
	b.	List and classify additive manufacturing processes.	5	L2	CO1
	c.	Apply design for additive manufacturing principles to improve component performance.	10	L3	CO1
		Module – 2			
3	a.	Define stereolithography and explain the SL resin curing process.	5	L2	CO2
	b.	Describe the working principle of selective laser sintering.	5	L2	CO2
	c.	Illustrate the various powder bed fusion mechanisms.	10	L3	CO2
		OR			
4	a.	Distinguish between SLS and EBM.	5	L2	CO2
	b.	State advantages and disadvantages of photo-polymerization process.	5	L2	CO2
	c.	Explain bio-extrusion and list its applications.	10	L3	CO2
		Module – 3			
5	a.	Define 3D printing and explain its evolution as an additive manufacturing process.	5	L1	CO3
	b.	Explain the principle of laminated object manufacturing.	5	L2	CO3
	c.	Illustrate the working of a typical beam deposition process with a neat sketch.	10	L3	CO3

		OR			
6	a.	What are the technical challenges associated with printing deposition processes.	**5**	**L1**	**CO3**
	b.	Describe the materials used and bonding methods in sheet lamination.	**5**	**L2**	**CO3**
	c.	Apply sheet lamination process to explain "Bond them form" and form then bond processes.	**10**	**L2**	**CO3**
		Module – 4			
7	a.	Define process selection and state its importance in additive manufacturing.	**5**	**L1**	**CO4**
	b.	Explain the selection methods used for part manufacturing.	**5**	**L2**	**CO4**
	c.	Explain how production planning and control is managed in additive manufacturing environments.	**10**	**L3**	**CO4**
		OR			
8	a.	List post processing techniques which are used to enhance components, which are manufactured by AM process.	**5**	**L1**	**CO4**
	b.	Explain the common problems encountered in STL files.	**5**	**L2**	**CO4**
	c.	Apply post processing methods to explain thermal and non thermal methods.	**10**	**L3**	**CO4**
		Module – 5			
9	a.	Evaluate discrete and blended multiple material processes with example.	**10**	**L4**	**CO5**
	b.	Describe the limitations of AM for medical applications.	**10**	**L3**	**CO5**
		OR			
10	a.	Compare direct digital manufacturing with rapid prototyping.	**10**	**L3**	**CO5**
	b.	Apply direct digital manufacturing in the production of customized foot wear.	**10**	**L4**	**CO5**

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CBCS SCHEME

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BME755A

Seventh Semester B.E/B.Tech. Degree Examination, Dec.2025/Jan.2026

Non-Traditional Machining

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
1	a.	Define Non-Traditional Machining (NTM) and explain its need.	5	L1	CO1
	b.	Classify NTM processes based on the type of energy used, giving one example each.	5	L2	CO1
	c.	Discuss the selection criteria for choosing on NTM process for a given job.	10	L3	CO1
		OR			
2	a.	Compare traditional and non-traditional machining processes.	10	L1	CO1
	b.	List advantages, limitations and applications of NTM processes.	10	L2	CO1
		Module – 2			
3	a.	Explain with neat sketch the construction and working of Ultrasonic Machining (USM).	8	L2	CO2
	b.	Describe process parameters affecting MRR and surface finish in USM.	8	L3	CO2
	c.	List advantages, limitations and applications of USM.	4	L1	CO2
		OR			
4	a.	Explain the working principle and construction of Abrasive Jet Machining (AJM) with neat sketch.	8	L2	CO2
	b.	Discuss the effect of process parameters such as carrier gas pressure, abrasive type and stand – off distance.	8	L3	CO2
	c.	State advantages and applications of AJM.	4	L1	CO2
		Module – 3			
5	a.	Explain with neat sketch the construction and working of Electro Chemical Machining (ECM).	8	L2	CO3
	b.	Discuss process parameters affecting performance of ECM.	8	L3	CO3
	c.	Differentiate between Electrochemical Grinding (ECG) and Electrochemical Honing (ECH).	4	L2	CO3

		OR			
6	a.	Explain with neat sketch the working of Chemical Machining (CHM) process.	**8**	**L2**	**CO3**
	b.	Describe Maskants and Etchants used in CHM.	**6**	**L3**	**CO3**
	c.	Write advantages, limitations and applications of CHM.	**6**	**L1**	**CO3**
		Module – 4			
7	a.	Explain the construction and working of Electrical Discharge Machining (EDM).	**8**	**L2**	**CO4**
	b.	Describe functions of dielectric fluid and flushing methods in EDM.	**6**	**L3**	**CO4**
	c.	Explain the principle and working of Wire EDM (WEDM).	**6**	**L2**	**CO4**
		OR			
8	a.	Explain the set up and working of Plasma Arc Machining (PAM) with neat sketch.	**8**	**L2**	**CO4**
	b.	Discuss process parameters and safety precautions in PAM.	**8**	**L3**	**CO4**
	c.	Mention advantages and limitations of PAM.	**4**	**L1**	**CO4**
		Module – 5			
9	a.	Explain the principle, setup, working of Laser Beam Machining (LBM).	**10**	**L2**	**CO5**
	b.	Write advantages, limitations and applications of LBM.	**5**	**L1**	**CO5**
	c.	Explain how laser parameters influence machining accuracy and surface quality.	**5**	**L2**	**CO5**
		OR			
10	a.	Explain the principle and working of Electron Beam Machining (EBM).	**10**	**L2**	**CO5**
	b.	Compare LBM and EBM based on principle, Equipment and applications.	**5**	**L2**	**CO5**
	c.	Write advantages, limitations and applications of EBM.	**5**	**L1**	**CO5**

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