Code: 23CE3201, 23ME3201

I B.Tech - II Semester – Regular Examinations - JULY 2024

ENGINEERING MECHANICS
(Common for CE, ME)

Duration: 3 hours   Max. Marks: 70

Note: 1. This question paper contains two Parts A and B.
2. Part-A contains 10 short answer questions. Each Question carries 2 Marks.
3. Part-B contains 5 essay questions with an internal choice from each unit. Each Question carries 10 marks.
4. All parts of Question paper must be answered in one place.
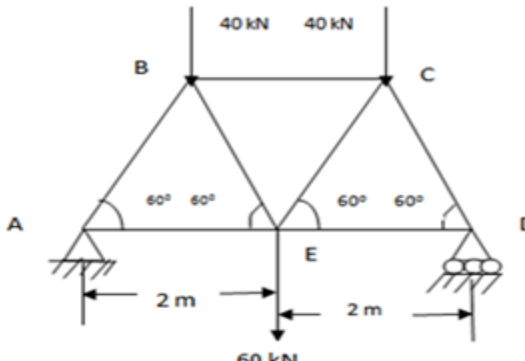
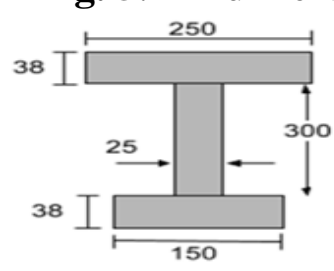BL – Blooms Level   CO – Course Outcome

PART – A

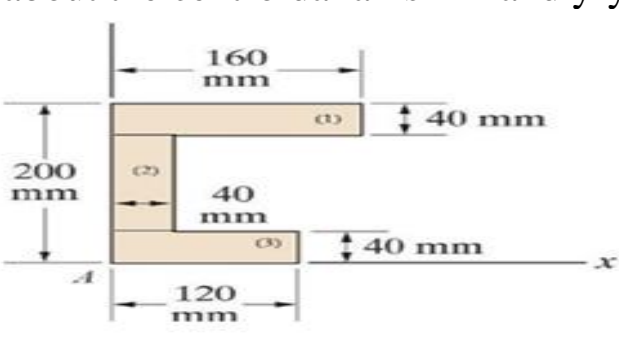|		BL	CO
1.a)	What is meant by non-coplanar concurrent system? Give an example.	L1	CO1
1.b)	What is a Free Body Diagram (FBD)? Draw FBD of a cylinder of weight 'W' resting on a floor.	L1	CO1
1.c)	Recall coefficient of friction.	L1	CO2
1.d)	Define truss. List out the types of trusses.	L1	CO2
1.e)	Define the term Area Moment of inertia.	L1	CO3
1.f)	Show the positions of centroid of semicircle and quarter circle from the base.	L1	CO3
1.g)	What are the differences between kinematics and kinetics?	L1	CO4
1.h)	State D'Alembert's principle? How it is applied in solving problems relating to dynamics?	L1	CO4
1.i)	Explain the difference between linear and angular velocity.	L2	CO5
1.j)	What is instantaneous axis of rotation?	L1	CO5

PART – B

			BL	CO	Max. Marks

UNIT-I

2	a)	Determine the resultant of the coplanar concurrent force system shown in **Fig.1.**	L2	CO1	5 M
		Fig. 1			
	b)	State and Prove Lami's theorem.	L2	CO1	5 M

OR

3	The cylinders shown in **Fig. 2** have the indicated weights and dimensions. Assuming smooth contact surfaces, determine the reactions at A, B, C and D on the cylinders.	L2	CO1	10 M
	Fig. 2			

UNIT-II

4	Calculate the force P required to start the wedge as shown in **Fig. 3.** The angle of friction for all surfaces of contact is 15°.	L3	CO2	10 M
	Fig. 3			

OR

5	Determine the forces in all the members of the truss shown in **Fig. 4.** and indicate the magnitude and nature of forces on the diagram of the truss. All inclined members are at 60^0 to the horizontal and length of each member is 2 m.	L3	CO2	10 M

40 kN   40 kN

B   C

60° 60°   60° 60°

A   D

E

2 m   2 m

60 kN

Fig. 4

UNIT-III

6	Calculate the positions of centroid of the given I - Section shown in **Fig. 5**. All dimensions are in mm.	L3	CO3	10 M

250

38

300

25

38

150

Fig. 5

OR

7	Solve the Moment of Inertia for the section shown in **Fig.6** about the centroidal axis x-x and y-y.	L3	CO3	10 M

160 mm

(1)   40 mm

200 mm   (2)

40 mm

(3)   40 mm   x

A

120 mm

Fig. 6

UNIT-IV

8	Two trains R and S start from rest simultaneously from stations A and B facing each other with accelerations 0.5 m/s^2 and 2/3	L3	CO4	10 M

	m/s^2 reaching their maximum speeds of 90 kmph and 72 kmph respectively. If they cross each other midway between the stations, find the distance between the stations and the time taken by each other.			
	OR			
9	Determine the constant force 'P' that will give the system of bodies shown in **Fig. 7**, a velocity of 5 m/sec after moving 8 m from rest. Coefficient of friction between the block and the plane is 0.25. Pulleys are smooth. Fig. 7	L3	CO4	10 M

UNIT-V

10	A pulley of weight 400N has a radius of 0.6m. A block of 600N is suspended by a rope wound round the pulley as shown in **Fig. 8.** Determine the resulting acceleration of the weight and tension in the rope. Fig. 8	L3	CO5	10 M
	OR			
11	The motion of a flywheel around its geometrical axis is described by the equation: $\omega=15t^2+3t+2$ rad/s and angular displacement is 160 radians at t=3 seconds. Find the angular acceleration, velocity, displacement at t = 1 second.	L3	CO5	10 M