EAST POINT COLLEGE OF ENGINEERING & TECHNOLOGY
An Autonomous Institution Affiliated to Visvesvaraya Technological University (VTU) Belagavi

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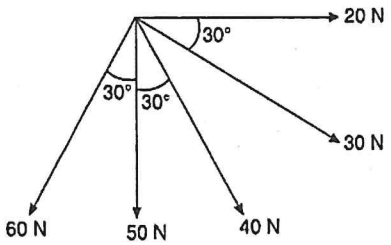
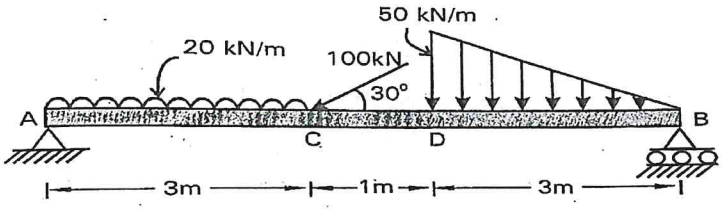
EPEMC203

Second Semester B.E. Degree Examination, July 2025
ENGINEERING MECHANICS

TIME:3 hrs. Max.Marks:100

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

		Module-1	M	L	C
Q.1	a	Define the couple and its characteristics.	4	L1	CO1
	b	Explain the principle of transmissibility.	6	L2	CO1
	c	Determine the resultant of the coplanar concurrent force system shown in Fig. 1(c).  Fig. 1 (c)	10	L3	CO1
		OR			
Q.2	a	Define the Free Body Diagram with suitable examples.	4	L1	CO1
	b	Define force and explain its characteristics.	6	L2	CO1
	c	At a point on a body, four forces act as given below. Determine the resultant and its orientation. 800 N towards the east. 600 N north 45^0 west. 1000 N at 30^0 south of west. 400 N at 40^0 east of north.	10	L3	CO1
		Module–2			
Q.3	a	State and prove Varignon's theorem.	8	L2	CO2
	b	Determine the reactions at the supports A and B for a beam loaded as shown in Fig. 3(b).  Fig. 3(b).	12	L3	CO2

		OR			
Q.4	**a**	State and prove Lami's theorem.	**08**	**L2**	**CO2**
	b	Determine tension in different parts of the string, also calculate W_1 and W_2. In Fig.4(b), the portion BC of the string is horizontal and the pulley is frictionless.	**12**	**L3**	**CO2**

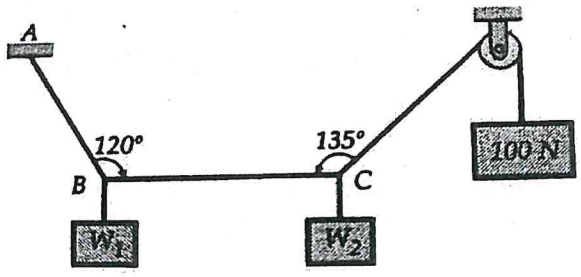


Fig. 4(b)

		Module–3			
Q.5	**a**	Explain the classifications of trusses briefly.	**6**	**L2**	**CO3**
	b	Analyze the truss shown in Fig. 5 (b) by the method of joints.	**14**	**L3**	**CO3**

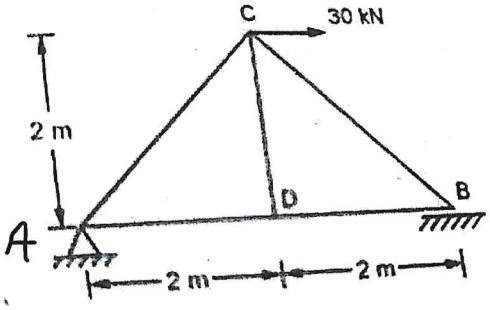


Fig. 5 (b)

		OR			
Q.6	**a**	Explain Wedge friction and Ladder friction.	**6**	**L2**	**CO3**
	b	A uniform ladder of weight 850 N and length 6m rests on horizontal ground and leans against a vertical wall. The angle made by the ladder with horizontal is 65°. The ladder has to support a man of weight 700 N standing on the ladder at a distance of 2 m from the top of the ladder. The coefficient of friction between ladder and wall is 0.2 and between ladder and floor is 0.3. Calculate the minimum horizontal force to be applied at the ground to prevent the slipping of the ladder.	**14**	**L3**	**CO3**
		Module–4			
Q.7	**a**	Derive the position of the centroid for a semi-circle from the first principle.	**10**	**L3**	**CO4**
	b	Locate the centroid of the shaded area shown in Fig. 7(b) below.	**10**	**L3**	**CO4**

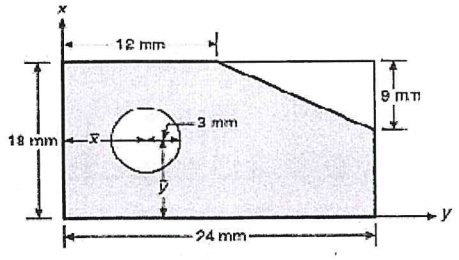
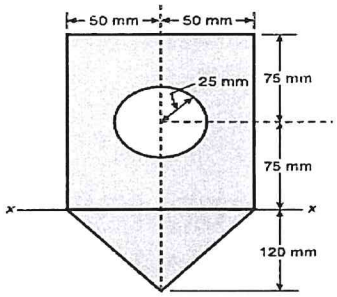


Fig. 7(b)

		OR			
Q.8	**a**	Derive an expression of M.O.I for a triangular section above the centroidal axis.	**10**	**L3**	**CO4**
	b	Determine the polar radius of gyration for the area is shown in Fig. 8 (b) below.  **Fig. 8 (b)**	**10**	**L3**	**CO4**
		Module–5			
Q.9	**a**	What is super elevation and why it will be provided?	**4**	**L1**	**CO5**
	b	State and explain Newton's laws of motion.	**6**	**L2**	**CO5**
	c	A body moves in a straight line has the equation of motion given by $S = 2t^3-4t+10$. Determine i) The time required for the body to gain a velocity of 68 m/s starting from rest. ii) The acceleration of the body when the velocity is equal to 32 m/s.	**10**	**L3**	**CO5**
		OR			
Q.10	**a**	Define: (i) Rectilinear motion and (ii) Curvilinear motion with an example.	**4**	**L1**	**CO5**
	b	Explain D'Alembert's Principle and mention the applications.	**6**	**L2**	**CO5**
	c	A stone is dropped from the top of the tower, 50 m high. At the same time, another stone is thrown up from the foot of the tower with a velocity of 25 m/sec. Calculate the distance from the top and after how much time the stones cross each other.	**10**	**L3**	**CO5**

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