BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

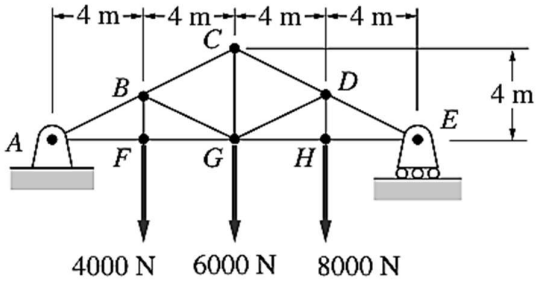
CLASS: B. TECH. **SEMESTER : I/ADD**
BRANCH: CSE/AIML/ECE/EEE **SESSION : MO/2025**

SUBJECT: ME24101 / ME101 BASICS OF MECHANICAL ENGINEERING

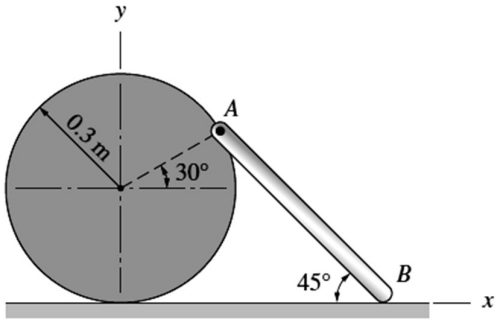
TIME: 3 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	Using method of sections, evaluate the forces in members *BC*, *BG*, and *FG* of the truss shown in the figure.	[5]	CO1, CO3, CO4	Evaluate

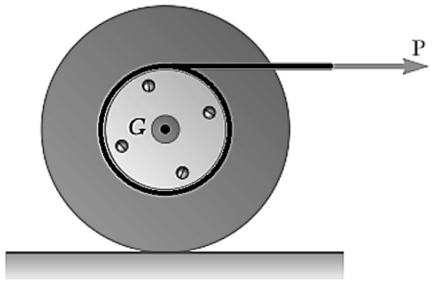


Q.1(b)	A bar *ABCD* consists of three sections: *AB* is 25 mm square and 50 mm long, *BC* is of 20 mm diameter and 40 mm long and *CD* is of 12 mm diameter and 50 mm long. Determine the stress set up in each section of the bar when it is subjected to an axial tensile load of 20 kN. What will be the total extension of the bar under this load? For the bar material, E = 210 GPa.	[5]	CO3, CO4	Apply
Q.2(a)	At the instant shown, the cylinder is rolling without slipping with an angular velocity of 2 rad/s counter-clockwise. The bar *AB* is pinned at *A* and the end *B* is moving on the horizontal plane. Find the co-ordinates of the instantaneous center of the bar *AB*, angular velocity of the bar *AB*, and determine the velocity of end *B*.	[5]	CO1, CO3	Analyse

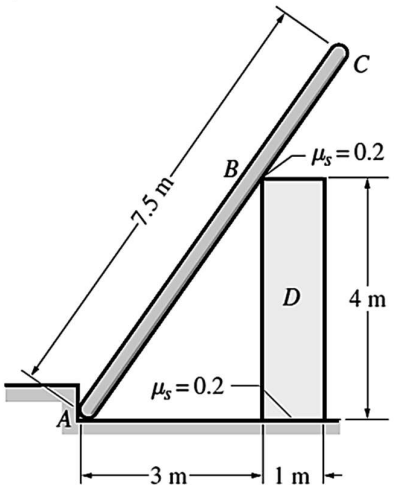


Q.2(b)	A drum of 60-mm radius is attached to a disk of 120- mm radius. The disk and drum have a total mass of 6 kg and a combined radius of gyration of 90 mm. A cord is attached as shown and pulled with a force *P* of magnitude 20 N. Knowing that the disk rolls without sliding, evaluate (a) the angular acceleration of the disk and the acceleration of *G*, and (b) the value of friction force.	[5]	CO2, CO3	Evaluate

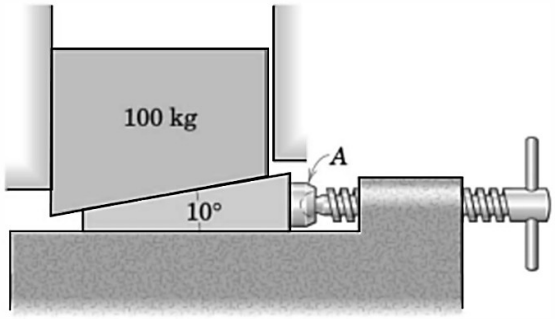
PTO



Q.3(a)	Find the weight of the lightest block *D* that can be used to support the 100-kg uniform pole *ABC* in the position shown.	[5]	CO2, CO3	Analyze



Q.3(b)	The vertical position of the 100-kg block is adjusted by the screw-activated wedge. Calculate the moment *M* which must be applied to the handle of the screw to raise the block. The single-thread screw has square threads with a mean diameter of 30 mm and advances 10 mm for each complete turn. The coefficient of friction for the screw threads is 0.25, and the coefficient of friction for all mating surfaces of the block and wedge is 0.40. Neglect friction at the ball joint *A*.	[5]	CO2, CO3	Evaluate



Q.4(a)	Differentiate between two stroke and four stroke SI-engine with neat sketches.	[5]	CO1	Remember, Understand
Q.4(b)	What are the requirements of a good boiler?	[5]	CO4	Remember, Understand
Q.5(a)	State the advantages and disadvantages of renewable energy and non-renewable energy resources.	[5]	CO1	Remember, Understand
Q.5(b)	Explain the working principle of a wind turbine. What are the advantages of using wind turbines compared with other renewable sources of energy.	[5]	CO4	Remember, Understand