

Indian Institute of Engineering Science and Technology, Shibpur
B.Tech (AE, CE, ME, MT, MN, CST, ETC, IT, EE) 2nd Semester Mid-Semester Examination,
February, 2024

Mechanics (AM 1201)

Full marks: 30

Time: 2 Hours

All notations have their usual meanings

(i) Take $g = 9.81 \text{ m/s}^2$. (ii) Assume suitable data not given in the question.

(iii) Answer any **Four (04)** questions

2 marks are reserved for neatness and handwriting

1. The uniform 50-kg bar with end rollers is supported by the horizontal and vertical surfaces and by the wire AC shown in Fig. 1. Calculate the tension T in the wire and the reactions against the rollers at A and at B. [7]
2. Calculate the horizontal force P on the light 10° wedge necessary to initiate movement of the 45-kg cylinder as shown in Fig. 2. The coefficient of static friction for both pairs of contacting surfaces is 0.30. Also determine the friction force F_B at point B. [7]

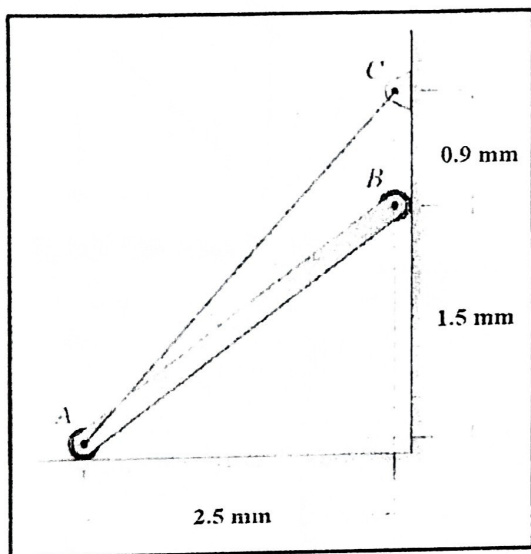


Fig. 1

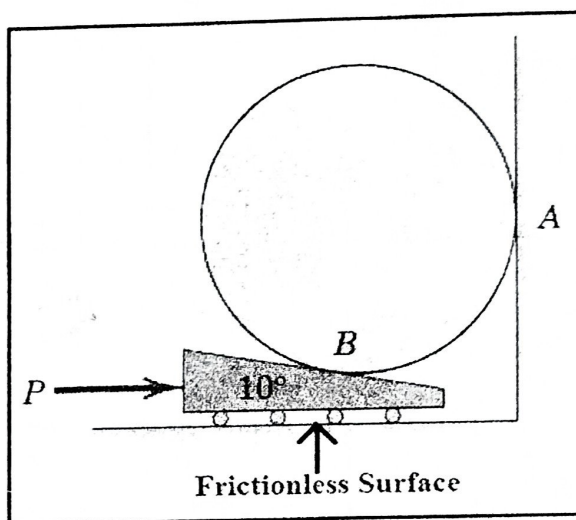


Fig. 2

3. A lifting device for transportation 155-kg steel drums is as shown in Fig. 3. Calculate the magnitude of the force exerted on the drum at E and F. [7]
4. Determine the forces in members BC, CI and HI of the truss structure loaded as shown in Fig. 4. [7]

5. The thickness of the triangular plate shown in Fig. 5 varies linearly with y from a value t_0 along its base $y = 0$ to $2t_0$ at $y = h$. Determine the y coordinate of the center of the mass of the plate considering (a) uniform density (b) linearly varying density with y from a value ρ_0 along its base $y = 0$ to $2\rho_0$ at $y = h$. [5+2]

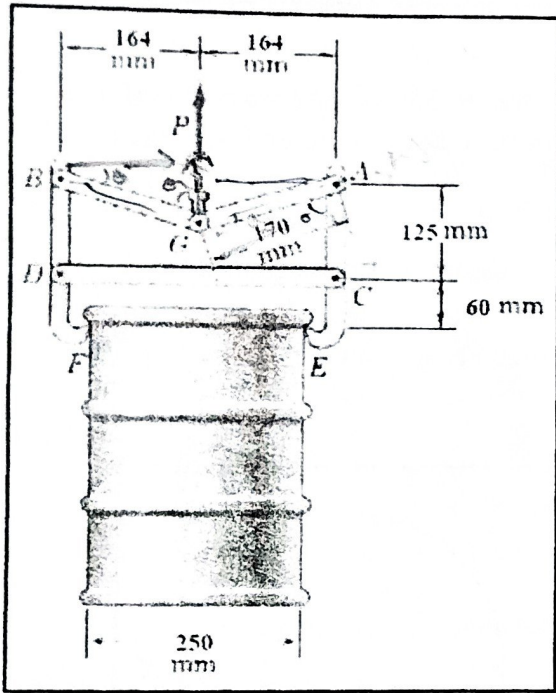


Fig. 3

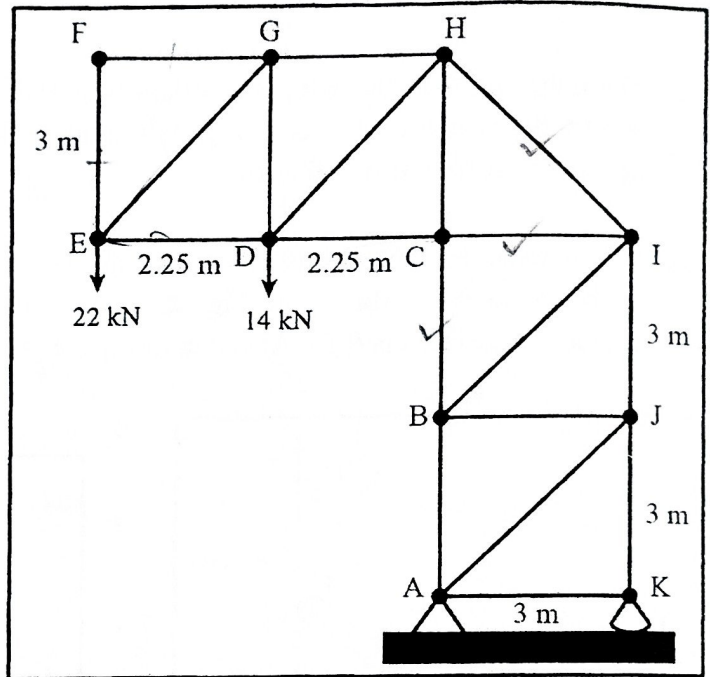


Fig. 4

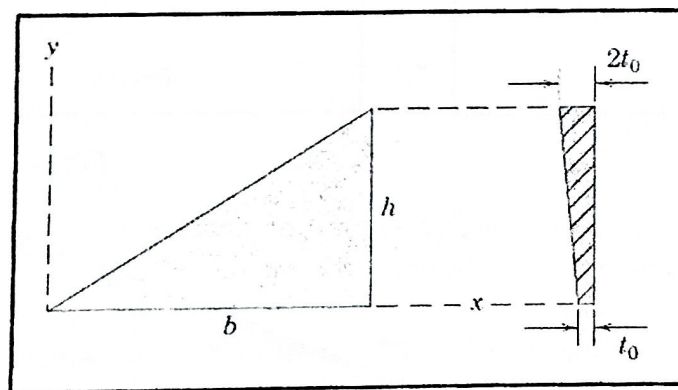


Fig. 5