

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

February, 2024

**Mechanics (AM 1201)**

Full marks: 30

Time: 2 Hours

All notations have their usual meanings

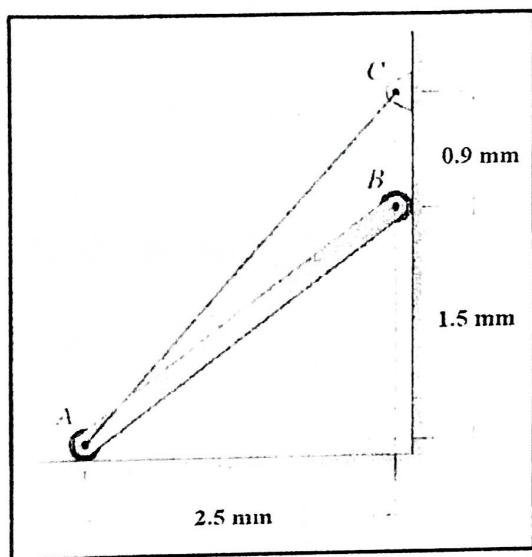
(i) Take  $g = 9.81 \text{ m/s}^2$ . (ii) Assume suitable data not given in the question.

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

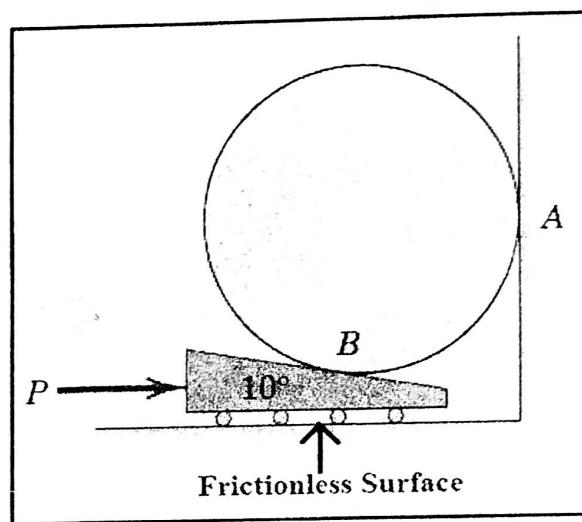
**2 marks are reserved for neatness and handwriting**

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- 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]
- Calculate the horizontal force P on the light  $10^\circ$  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 FB at point B. [7]



**Fig. 1**



**Fig. 2**

- 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]
- 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  $\rho_0$  along its base  $y = 0$  to  $2\rho_0$  at  $y = h$ .
- [5+2]

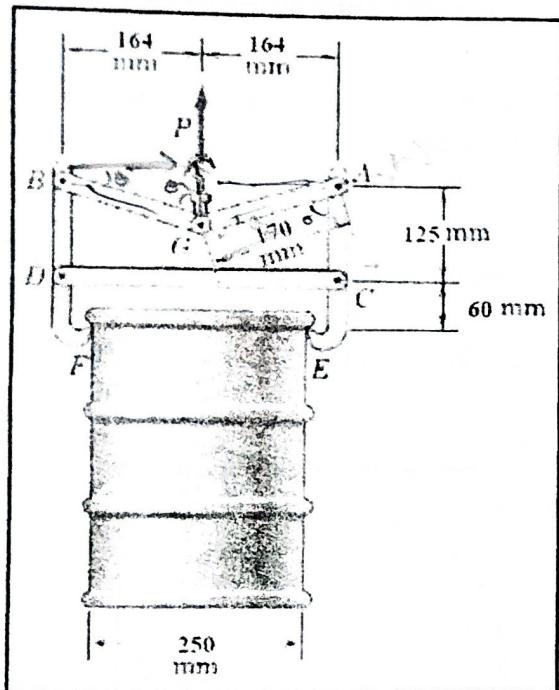


Fig. 3

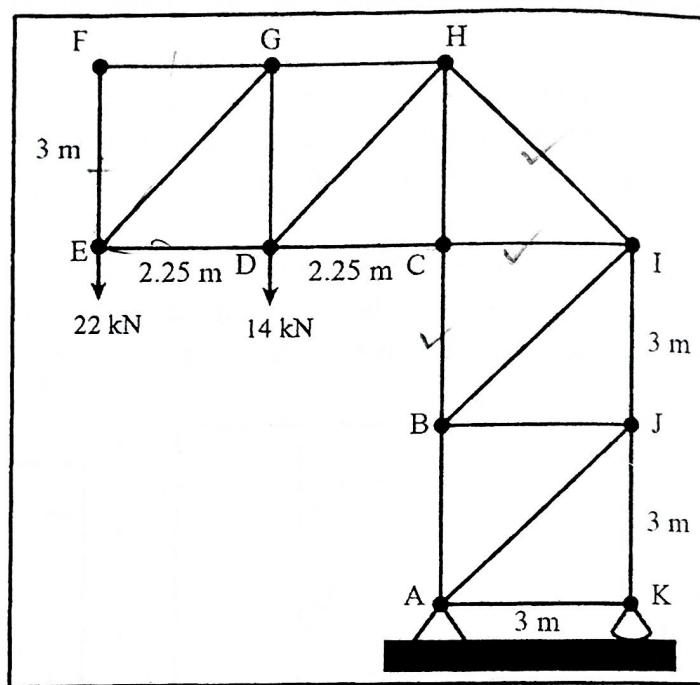


Fig. 4

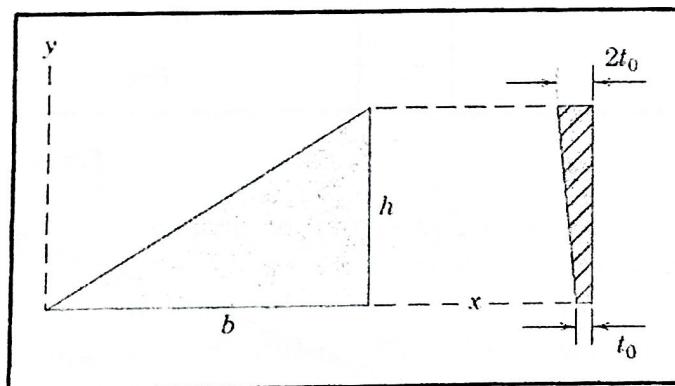


Fig. 5