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# BMS College of Engineering, Bangalore-560019

**(Autonomous Institute, Affiliated to VTU, Belgaum)**

## July / August 2017 Supplementary Semester Examinations

**Course: Engineering Mechanics** **Duration: 3 Hours**
**Course Code: 14CV1ICENM/14CV2ICENM** **Max Marks: 100**
**Date: 28.07.2017**

**Instruction:**
1. Q1 is compulsory and answer any four full questions from the remaining
2. Draw neat sketches wherever necessary

1.

a) With the help of neat sketches explain different types of supports. **4x5=20**

b) Show that the maximum angle of friction is equal to the angle of repose.

c) State and prove parallel axis theorem of moment of inertia.

d) Show that the path traced by a projectile is parabolic.

2. a) Two identical rollers, each of weights 100 N are supported by an inclined plane and a vertical wall as shown in Fig. 2a. Assuming smooth surfaces, determine the reactions induced at the points of supports A, B, C and D. **10**

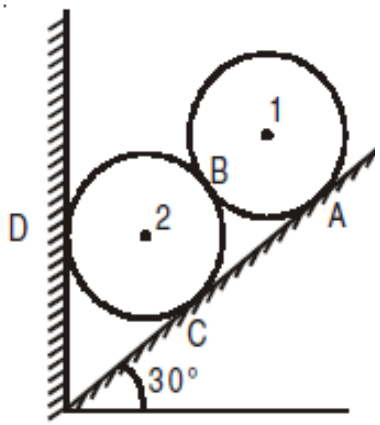


**Fig. 2a**

b) Determine the resultant of the forces acting on the dam section shown in Fig. 2b and locate its intersection with the base AB. For a safe design this intersection should occur within the middle third. Assess the safety of the dam. **10**

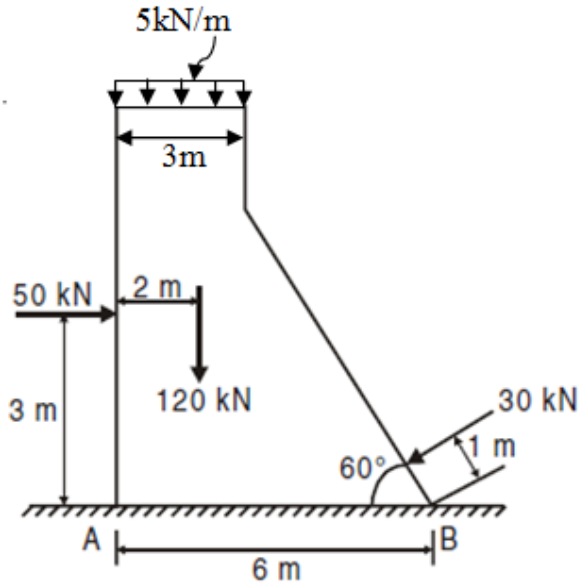


**Fig. 2b**

3. a) Determine the reactions at supports A and B of the beam shown in Fig. 3a. **08**

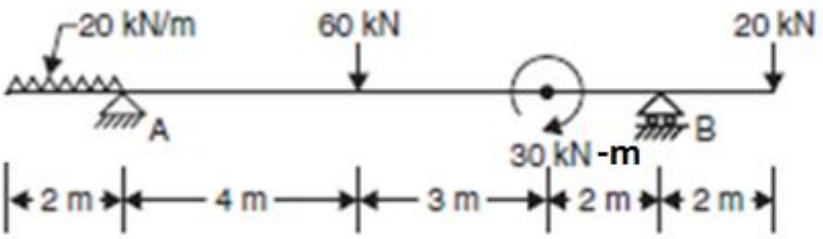


**Fig. 3a**

b) Analyze the truss shown in Fig. 3b using method of joints and tabulate the results. **12**

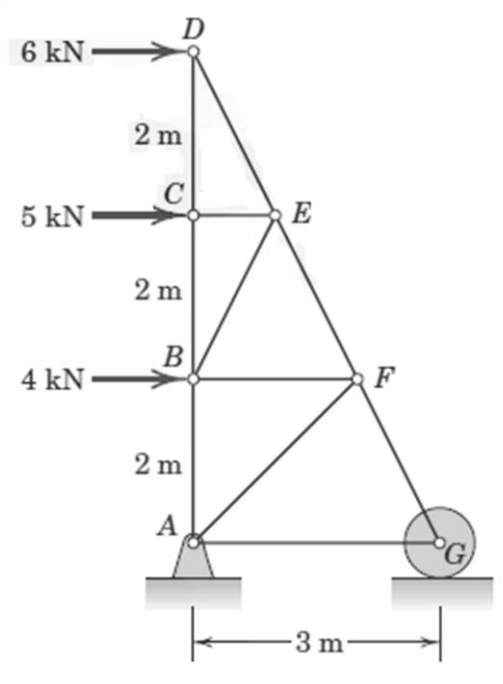


**Fig. 3b**

4. a) Determine the centroid of the bent wire (ABCD) with respect to the axes shown in Fig. 4a. **08**

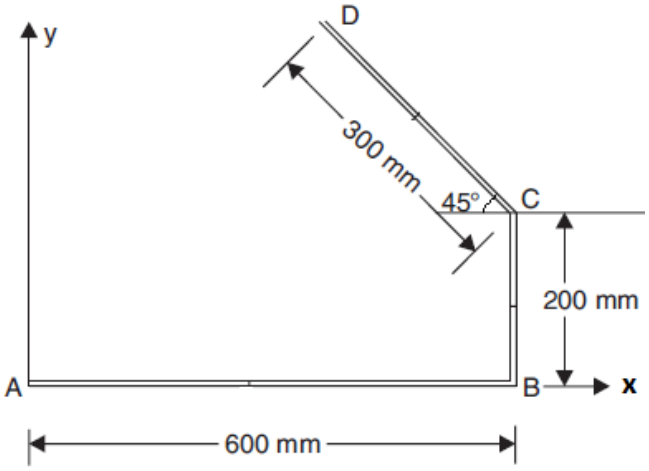


**Fig. 4a**

b) Determine the moment of inertia and radius of gyration of the built-up section shown in Fig. 4b about the horizontal centroidal axis. All the dimensions are given in mm. **12**

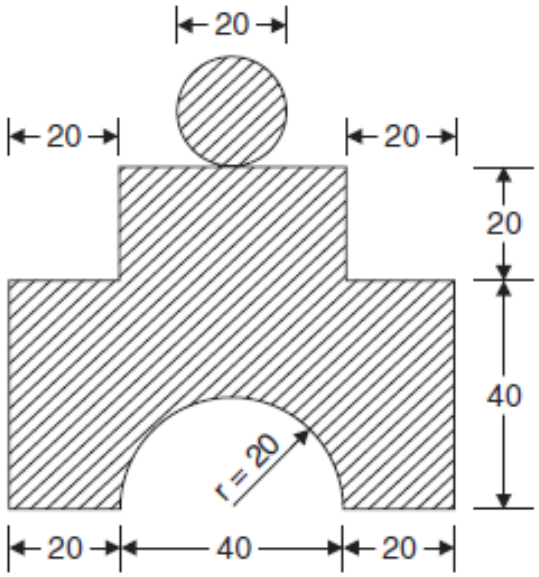


**Fig. 4b**

5. a) A 6.5 m ladder AB of weight "W" leans against a smooth wall as shown in Fig. 5a. Assuming that the coefficient of static friction $\mu_s$ is zero at B, determine the smallest value of $\mu_s$ at A for which equilibrium is maintained. **08**

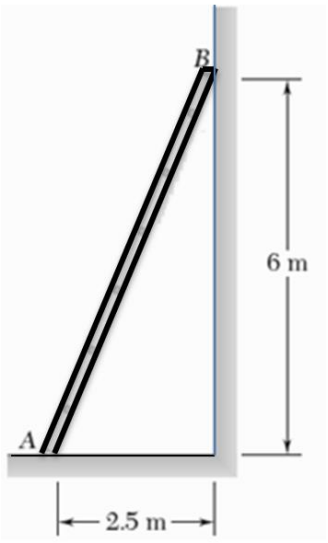


**Fig. 5a**

b) Block A shown in Fig. 5b weighs 2000 N. The cord attached to A passes over a fixed drum and supports a weight equal to 800 N. The value of coefficient of friction between A and the horizontal plane is 0.25 and between the rope and the fixed drum is 0.1. Angle of wrap over the drum is 120°. Solve for P: (1) if motion is impending towards the left, (2) if the motion is impending towards the right.

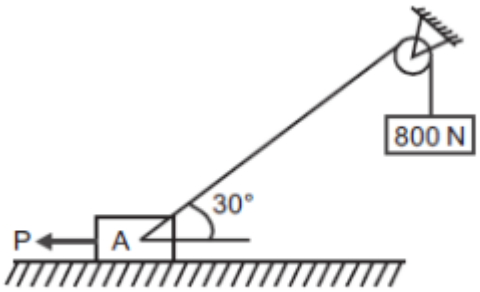


**Fig. 5b**

6. a When the forward speed of the 30 kN truck shown in Fig. 6a was 15 m/s, the brakes were suddenly applied, causing all four wheels to stop rotating. It was observed that the truck skidded to rest in 20 m. Determine the co-efficient of friction (μ) between the road surface and the wheels and also calculate the magnitude of the normal reaction at each wheel as the truck skidded to rest. Apply D'Alembert's principle. **12**

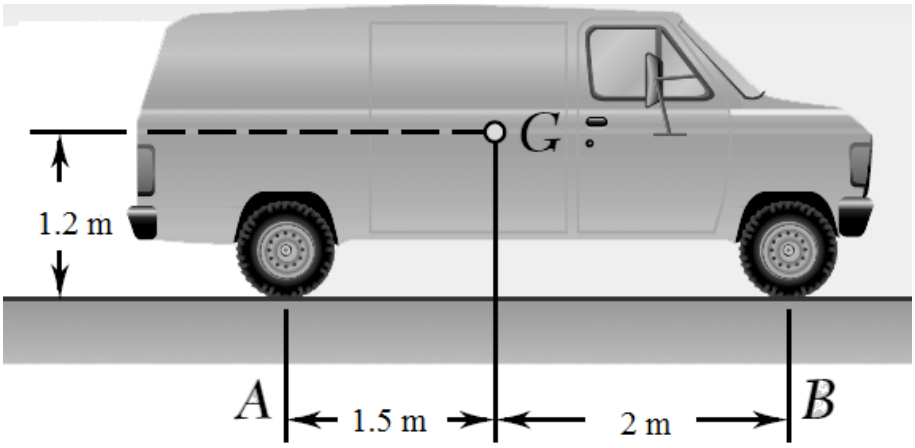


**Fig. 6a**

b A projectile is launched from point A with speed $v_0$ = 30 m/s and angle of projection $\alpha$ = 30°. Determine the time required to strike the ground at point B as shown in the Fig. 6b. Also determine the corresponding value of Range (R). **08**

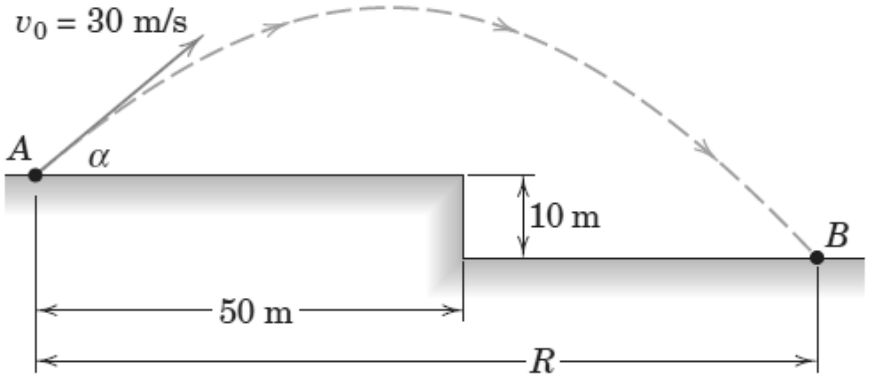


**Fig. 6b**

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