(Following Paper ID and Roll No. to be filled in your Answer Book)

Paper ID : 154113   Roll No. [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ]

B.Tech.

THEORY EXAMINATION, 2015-16

ENGINEERING MECHANICS

[Time : 3 hours]   [Total Marks : 100]

Note: (1) Attempt all questions.

(2) Assume missing data suitably, if any.

SECTION-A

1. Attempt **all** parts. All parts carry equal marks. Write answer of each part in short.   **(2x10=20)**

    (a) Differentiate between Kinetics and Kinematics.

    (b) What is principle of transmissibility of a force, explain it with suitable example?

    (c) Two forces of magnitude 50 KN and 80 KN are acting on a particle, such that the angle between the two is 75°. Calculate the resultant and find its direction.

    (d) What is a couple? Explain it with suitable example.

    (e) State parallel axis theorem with a sketch.

(f) Differentiate between centroid and center of gravity.

(g) Define Co-efficient of friction and angle of friction.

(h) A car accelerates uniformly from a sped of 30 Km/Hr to a speed of 75 Km/Hr in 5 seconds. Determine the acceleration of the car and the distance travelled by the car during 5 seconds.

(i) What do you mean by resilience and proof resilience?

(j) What is work energy principle?

SECTION-B

Note : Attempt any **five** parts: (5X10=50)

2. Find out magnitude of force P required to start the roller over the step as shown in figure 1.
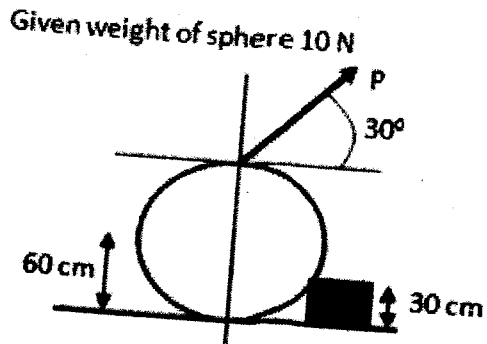
Given weight of sphere 10 N

Figure 1

3. A ladder 5 m long, weighing 250 N is resting against a wall at an angle of 60° with the horizontal floor. A man weighing 750 N climbs the ladder. At what position along the ladder from the bottom does he induce slipping? The coefficient of friction between wall and ladder as well as floor is 0.3.

4. Find the magnitude, direction and position of resultant shown in Figure 2, acting on a lamina of equilateral triangular shape.
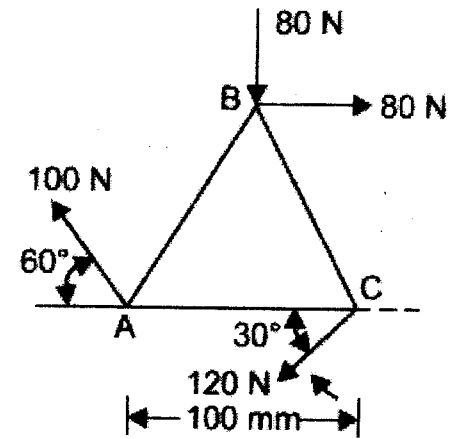
Figure 2

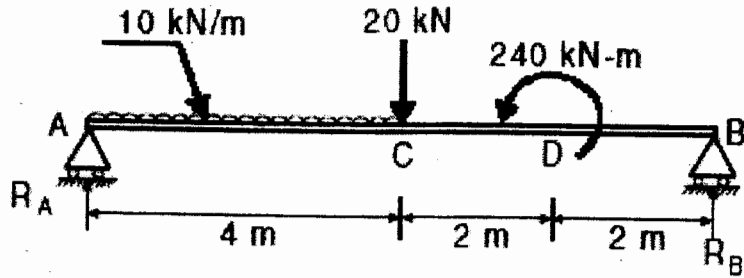5. Draw the shear force and bending moment diagram for the beam shown in figure 3.

Figure 3

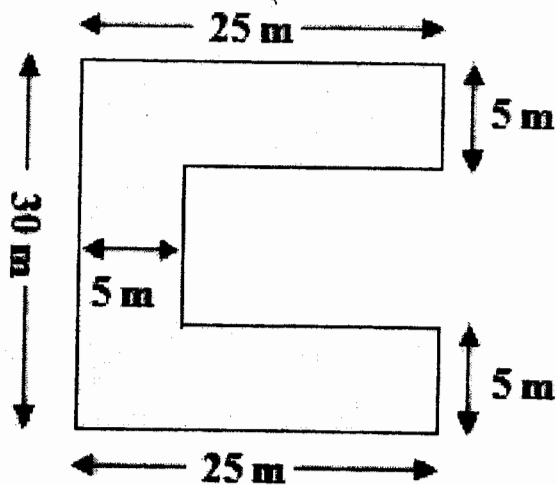6. Calculate the moment of Inertia of section about the centroidal axis as shown in Figure 4.

Figure 4

7. The motion of a particle is defined by $a = 10t - t^2$. How far will it move from rest before starting to reverse its direction of motion? Also compute the velocity of the particle when it returns to its starting position.

8. The rotor of an electric motor uniformly accelerates to a speed of 1800 RPM from rest in 5 seconds and then the rotor decelerates uniformly to stop. If the total time elapsed from start to stop is 12.3 second, determine the number of revolutions made while acceleration and deceleration.

9. Determine the weight 'W' that will give the system of bodies a velocity of 3 m/s after moving a distance of 4.5 m from position of rest. Coefficient of friction at all contact points is 0.2. Assume pulley as frictionless (Figure 5).
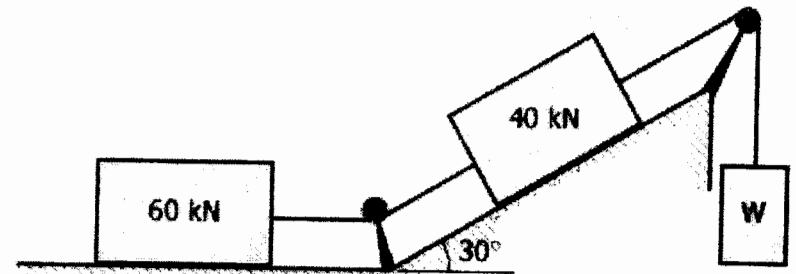

Figure 5

(4)

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• (5)

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SECTION-C

Note: Attempt any **two** parts of the following: **(2x15=30)**

10. Attempt both parts of the following: **(2x7.5=15)**

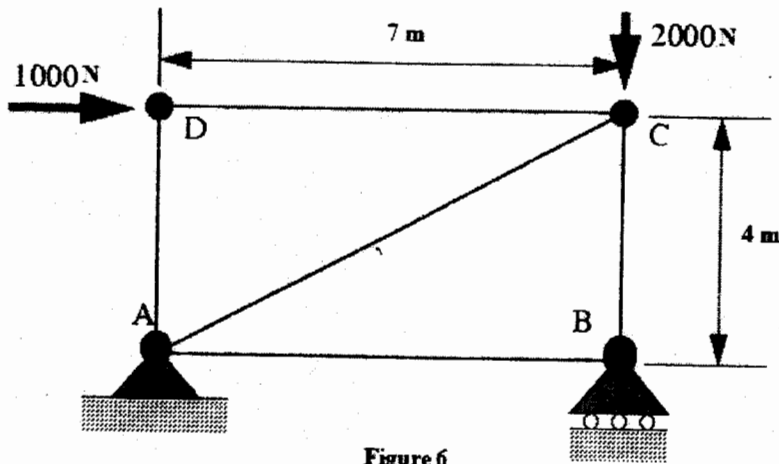(a) Find the forces in all the members of the truss as given in Figure 6.

Figure 6

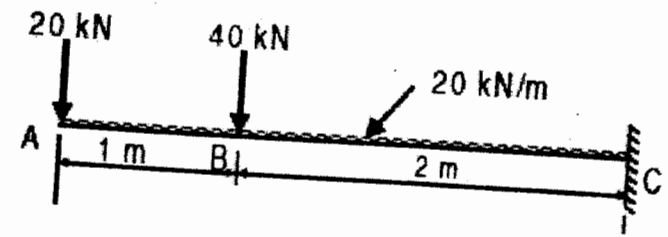(b) Draw the shear force and bending moment diagram for the beam shown in figure 7.

Figure 7

11. Attempt both parts of the following: **(2x7.5=15)**

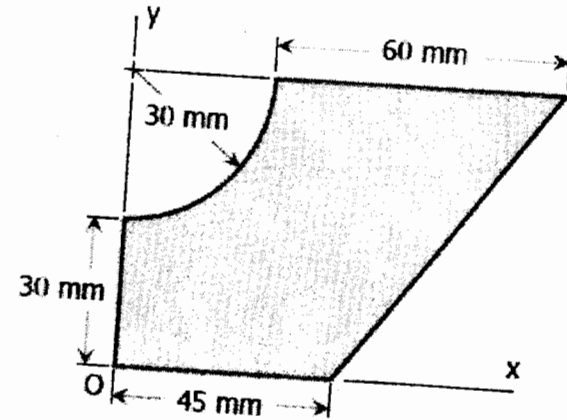(a) Determine the centroid of given Figure 8 about the given axis.

Figure 8

(6)

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(7)

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(b) Derive an expression for mass moment of Inertia of Solid sphere of base radius 'R' and mass 'M'.

12. $\frac{M}{I} = \frac{\sigma}{y} = \frac{E}{R}$ Attempt both parts of the following: **(2 x 7.5 = 15)**

(a) Drive an expression for pure bending:

(b) Determine the diameter of solid shaft which will transmit 450 kW at 300 RPM. The angle of twist must not exceed one degree per meter length and maximum torsional shear stress is to be limited to 40 N/mm². Assume $G = 80$ kN/mm²

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