Engineering Mechanics
(Old) (1060)

P. Pages : 4

Time : Three Hours **Max. Marks : 100**

Instructions to Candidates :
1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Figures to right indicates full marks.
5. Assume suitable data if necessary.
6. Solve **any two** questions from each unit.

UNIT – I

1. a) Explain : **2**
i) moment ii) Couple.

b) Determine resultant of given force system in figure 1. **8**

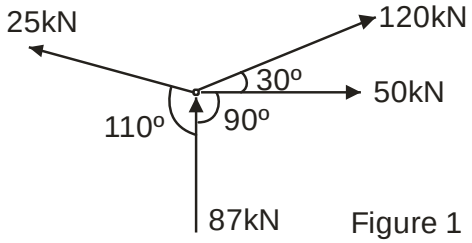

Figure 1

2. Two forces P=6N, and Q=10 N act on a particle and their lines of action are inclined to each other at an angle of 70°. Find what third force R will keep the particle in equilibrium. **10**

3. A 4mx5m slab consist four forces normal to it as shown in figure 2. Determine equivalent action which can be applied at origin 0, and determine the single resultant of the force system. **10**

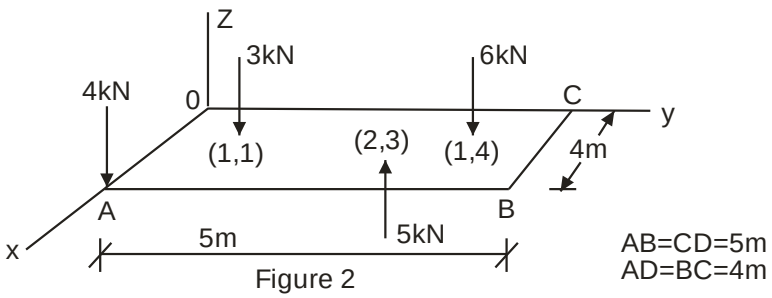

Figure 2

UNIT – II

4. a) Define moment of inertia. **2**

b) Find the forces in all members of truss shown in figure 3. **8**

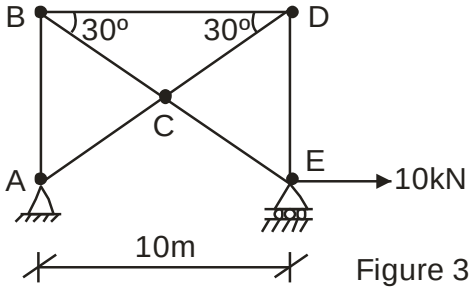

Figure 3

5. Find reaction at the supports for given beam as shown in figure 4. **10**

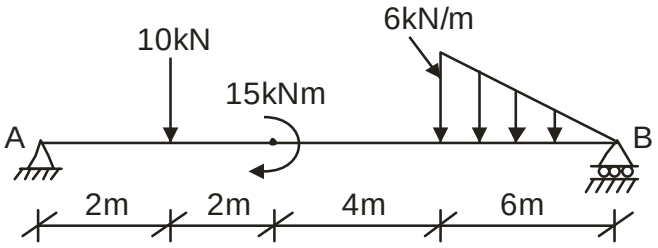

Figure 4

6. Locate the centroid of area shown in figure 5. **10**

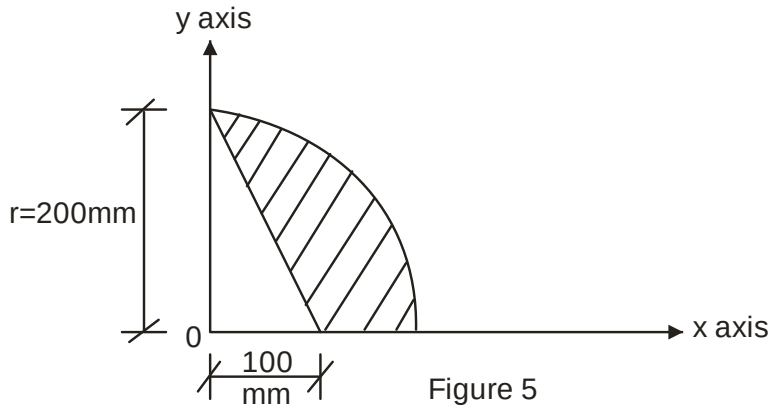

Figure 5

UNIT – III

7. a) The acceleration of a particle is defined by $a=-K(v)^{2.5}$ where K is constant. The particle starts at x=0 with velocity 16 m/s and when x=6m, v is 4m/s. Determine time when velocity is 8 m/s. **8**

b) Explain principle of momentum and impulse. **2**

8. a) Derive the equations of motion for general rectilinear motion. **4**

b) A ball is dropped on a floor from height of 1m, rises back 0.75m. Find out coefficient of restitution between floor and ball. **6**

9. a) Define work, power and energy. **2**

b) Two planes A and B flying horizontally at the same altitude. The airplane A flying due west at constant speed of 500 kmph while plane B is flying north-east with a constant speed of 350 kmph. Determine displacement of plane B after 2 hours. **8**

UNIT – IV

10. In the figure 6 crank OA rotates at 80 rpm anticlockwise. Determine angular velocity of BC and velocity of mid-point of rod AB, at the instant shown. **10**

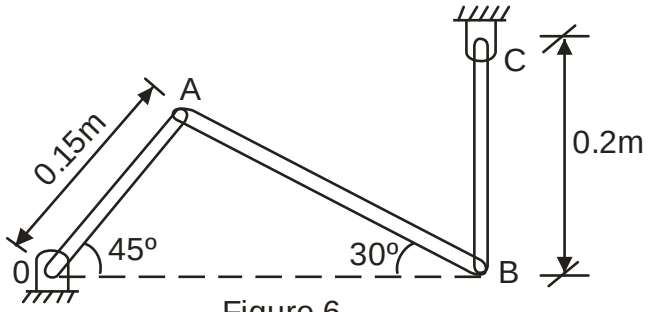

Figure 6

11. a) Derive the equation for the time period of the compound pendulum. **6**

b) A flywheel 460 mm in diameter is brought uniformly from rest upto a speed of 280 rpm in 15 seconds. Find the velocity of a point on the rim 1 second after starting from rest. **4**

12. A chain of length L meters and mass 'm' kg per meter length is held at the upper end such its lower end just touches the floor. The chain is then released. Determine the dynamic reaction exerted by the floor on the chain as a function of length 'x' fallen to the floor. **10**

UNIT – V

13. a) Derive radial and transverse component of velocity and acceleration for curvilinear motion. **7**

b) Define 'friction' in detail. **3**

14. A stone is projected from top of a tower 50m high with a velocity of 20 m/s in a direction making an angle of 30º with the horizontal. Find distance from the foot of tower to the point at which the stone will hit the ground. **10**

15. Refer to figure 7. Block A having a mass of 45 kg rests on block B having a mass of 90 kg and tied with a horizontal string to the wall at C. If the coefficient of friction between A and B is $\frac{1}{4}$ and between B and surface is $\frac{1}{3}$. What horizontal force 'P' is necessary to move Block B. **10**

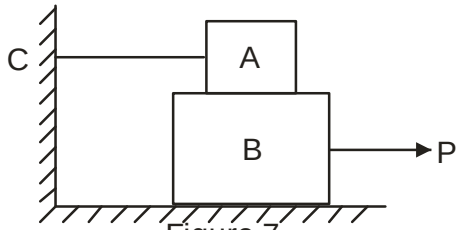

Figure 7

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