(c) Determine the moment of inertia of the shaded area (Fig. 8) about x and y axes. **(10)**

Fig. 8

4. Attempt any two parts of the following:

(a) A couple M=100 kN m is applied to the crank AB (Fig. 9). Knowing that AB =50 mm and BC = 200 mm, determine the force P required to maintain the equilibrium of the system when $\theta=60^0$. **(10)**

(b) For the mechanism shown in Fig. 10, the spring is uncompressed when $\theta=0^0$. Find the angle θ at equilibrium position. **(10)**

Fig. 9

Fig. 10

(c) A 10 kg block is attached to the rim of a 300 mm radius disk as shown in Fig. 11. Knowing that spring BC is unstretched, when $\theta=0^0$, determine the position or positions of equilibrium. **(10)**

5. Attempt any two parts of the following:

(a) A particle is moving along the path whose equation is r=4θ m. If the angle $\theta=t^3$ rad, determine the velocity and acceleration of the particle when $\theta=60^0$. **(10)**

(b) The two blocks shown in Fig. 12 start from rest. The horizontal plane and the pulley are frictionless and the pulley is assumed to

be of negligible mass. Determine the acceleration of each block and tension in each cord. **(10)**

(c) A car of weight 100 kN is travelling at 30 m/s. Its speed is reduced to 10 m/s by a constant breaking force over a distance of 75 m. Find the breaking force. **(10)**

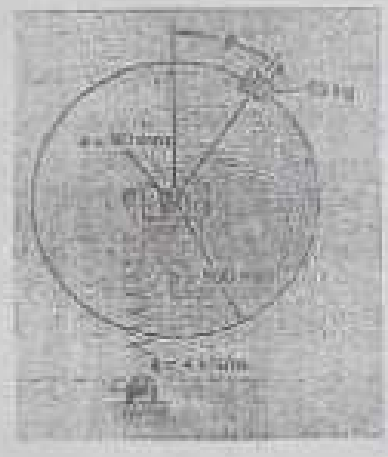

Fig. 11

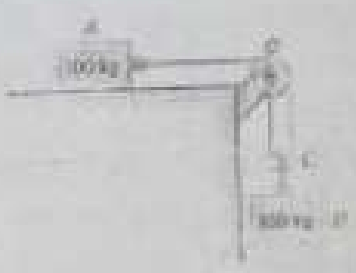

Fig. 12

(b) Calculate the value of maximum bending moment and its position for simple supported beam as shown in Fig. 4. All the dimensions are in m. **(10)**

Fig. 4

(c) A truss is shown in Fig. 5. Determine the force in members CD and DF. Given that BD=DF=FH=HJ=2.4 m. **(10)**

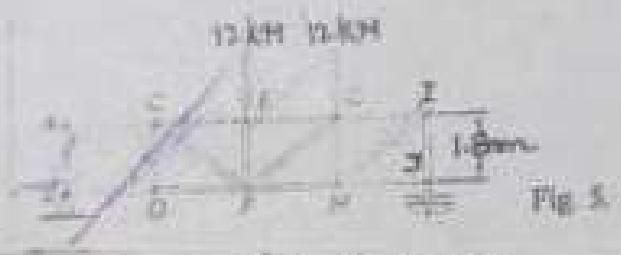

Fig. 5

3. Attempt any two parts of the following:

(a) Find the center of mass of the bent wire ABCD shown in x-y plane (Fig. 6). All dimensions are in mm. **(10)**

(b) Find the product of inertia and second moment of area about x and y axes for the area shown in fig. 7. **(10)**

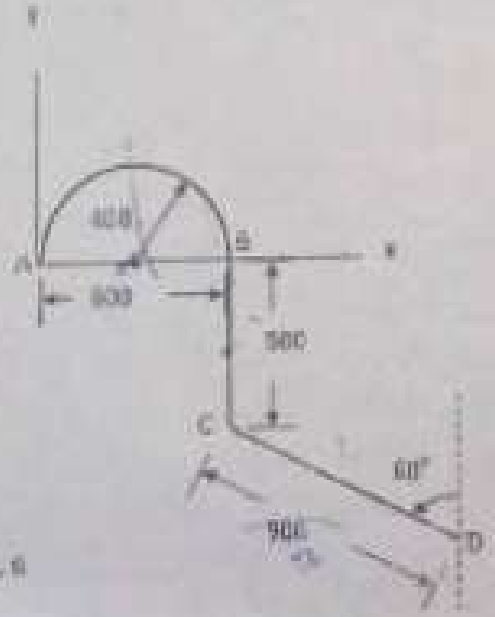

Fig. 6

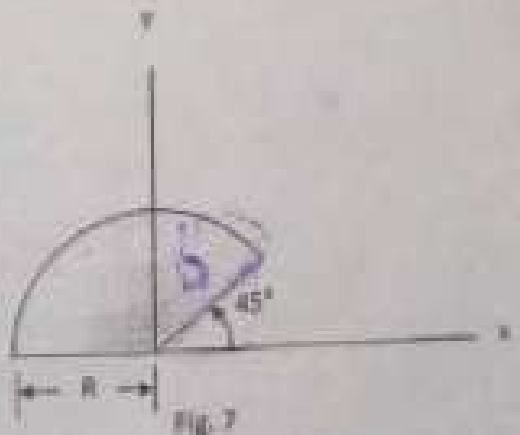

Fig. 7

B.Tech.
Second Semester Examination, 2014-15
Engineering Mechanics

Time: 3 Hours **Total Marks: 100**

Note: Attempt all questions. Assume missing data, if any.

1. Attempt two parts of the following:

(a) A 4.8 m long beam is subjected to the forces is shown in Fig. 1. Reduce the given system of forces to (i) an equivalent force couple system at A.(ii) an equivalent force couple system at B and (iii) a single force or resultant. **(10)**

(b) Neglecting friction and radius of pulley (Fig. 2), determine (i) tension in the cable ADB and (ii) the reaction at C. **(10)**

(c) The coefficients of friction are $\mu_s=0.4$ and $\mu_k=0.3$ between all the surface of contact (Fig. 3). Determine the smallest force P required to start the 30 kg block if cable AB (i) is attached as shown in the figure and (iii) is removed. **(10)**

Fig.1

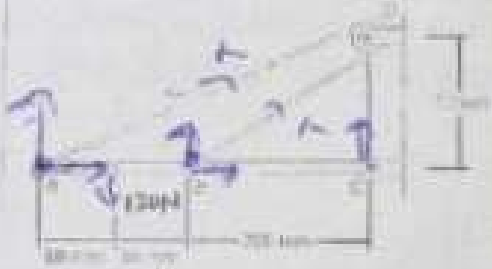

Fig. 2

Fig. 3

2. Attempt any two parts of the following:

(a) (i) A uniformly distributed load w (kN/m) is acting over entire length of a 3 m long cantilever beam. If the shear force at the mid- point of cantilever is 6 kN, what is the value of w? **(5)**

(ii) A simply supported beam carries a central concentrated load. The maximum bending moment is M. If the same load be uniformly distributed over the beam length, what will be the maximum bending moment? **(5)**