Regd. No.

B.E./B.Tech. DEGREE EXAMINATIONS, APR/MAY 2014
II – Semester, Regulations 2012
(Common to All Non-Circuit Branches and Electrical and Electronics Engineering)
GE8251 – ENGINEERING MECHANICS

Duration: 3-Hours **Max. Marks: 100**

Answer ALL questions

Part – A (10X2 = 20 marks)

1 Find the resultant and its direction of two forces shown in Fig. 1.

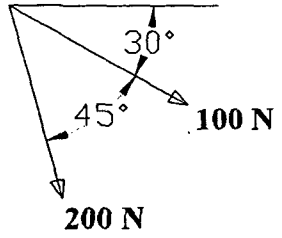

Fig. 1

2 What is the magnitude and direction of force $F = 5i + 10j - 3k$ *kN*?

3 State the equilibrium conditions to be satisfied for the body applied with system of non-concurrent coplanar forces?

4 What is the tension in the strings of the beam shown in Fig. 4

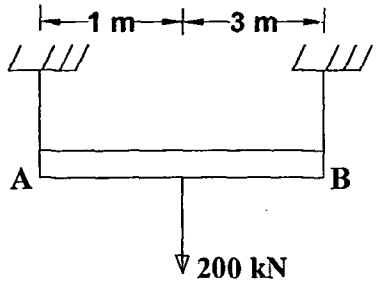

Fig. 2

5 Locate the centroid for i) right angle triangle ii) semi circular area

6 Differentiate between area moment of inertia and mass moment of inertia.

7 The velocity of a particle is given by $V = 4t^3 - 5t^2$. When does the acceleration of the particle becomes zero?

8 A body of mass 5 kg is pushed up to 2 m on a smooth 30° incline by a force of 60 N acting prallel to the plane. What is the work done on the body?

9 Write the kinematic equations for the body roating about a fixed axis with constant acceleration.

10 Define the coefficient of friction from the law of static friction.

Part – B (5 X 16 = 80 marks)
Q11 compulsory& from Q12 onwards answer either (a) or (b)

11 (i) Determine the horizontal force 'P' required for the wedge 'B' to raise the block 'A' of weight 4000 N as shown in Fig. 11 (i). If the co-efficient of friction on all surfaces is equal to 0.3. (10)

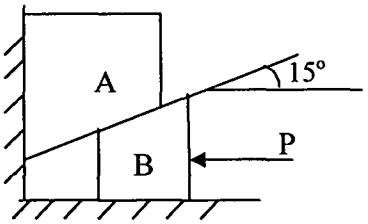

Fig. 11 (i)

(ii) A ladder of length 10 m and weight 300 N is leaning against a vertical wall with an angle of 30° to the vertical. A man of weight 500 N climbs the ladder. Find the distance of the location of the man, at which the slipping will occur. Take co-efficient of friction for all the contact surfaces equal to 0.3. (6)

12 a) i) Four cables AB, BC, BE, and BF are attached to a ring as shown in Fig. 12a-i. The cables BE and BF pass through a frictionless pulley at E and F and carry 600 N at their ends. Determine the magnitude of the tensile forces in cables AB and BC. (8)

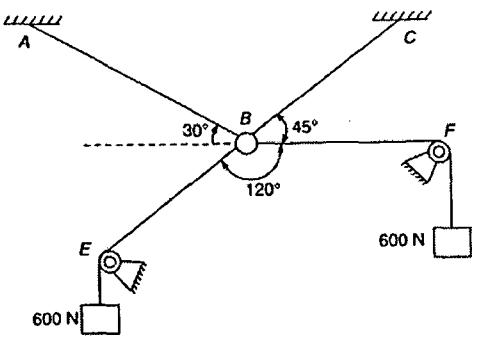

Fig. 12a-i

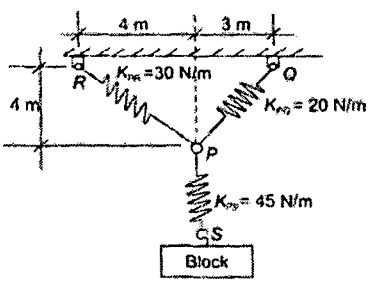

Fig. 12a-ii

(ii) The unstretched length of the spring PQ shown in Fig. 12a-ii is 2.5 m. A block is held in the equilibrium position as shown in the Fig. Determine the mass of the block at S (8)

[OR]

12 b) i) If a force F of 150 kN acts along line PQ where the coordinates of P and Q are P(1,2,3) and Q(1,3,-4), find the components of the force along line PS if the coordinates for the point S is (-3,4,3). (6)

ii) A metal guy rope tied to a peg at a point P as shown in Fig. 12b-ii keeps an electrical post in equilibrium. The force in the guy rope is 1.25 kN. Find the components of the force at P and the angles of inclination of the force with the three rectangular axes. (10)

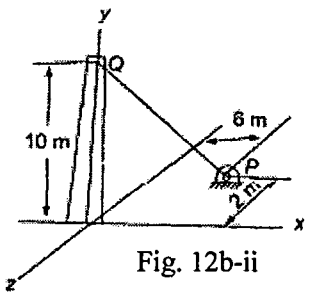

Fig. 12b-ii

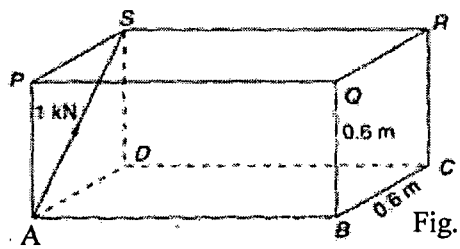

Fig. 13a

13a A rectangular block 1 m X 0.6 m X 0.6 m is applied with a force of 1 kN as shown in Fig. 13a. Determine the moment (i) about point Q and (ii) about the diagonal QD. (16)

[OR]

13 b A 3 m boom is acted upon by the 4 kN force as shown in Fig. 13b. Determine the tension in each cable and the reaction at the ball and socket joint at A. (16)

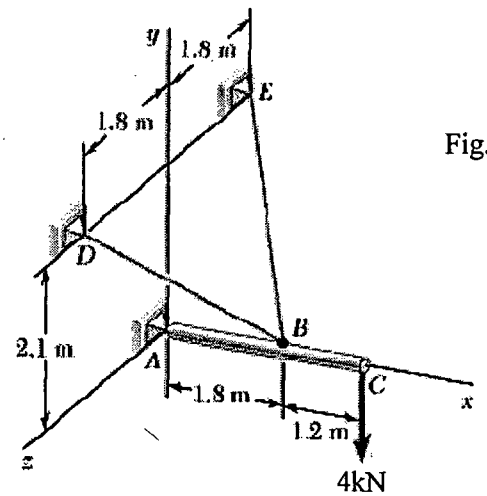

Fig. 13b

14 a) Find the volume of the object produced when the shaded area shown in Fig. 14a is revolved i) about ox' and ii) about oy' (16)

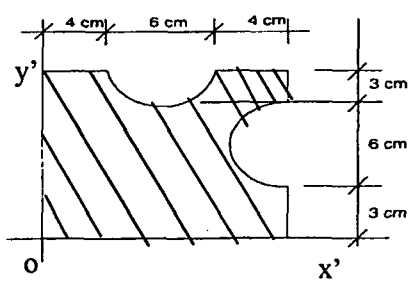

Fig. 14a

[OR]

14b) Find the area moment of inertia about the centroidal axes for the section shown in Fig. 14b (16)

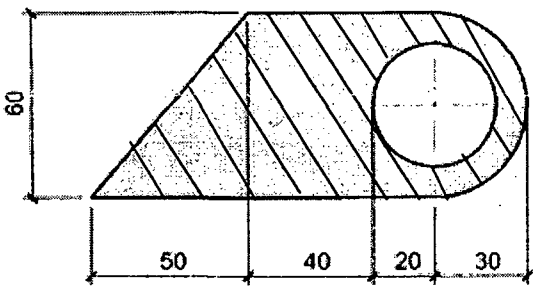

Fig. 14b

All dimensions are in 'mm'

15 a) (i) A stone is thrown vertically upwards at the bank of a water tank, which is located 50 m above the water level. If it strikes the water after 5 s, determine (i) the speed at which the stone was thrown up and (ii) the speed at which the stone strikes the water. (8)

(ii) A ball is thrown with an initial velocity V_1 of 20 m/s from point P as shown in Fig. 15a-ii. Determine (i) the maximum height h at which the ball can hit the wall and (ii) the corresponding angle θ. (8)

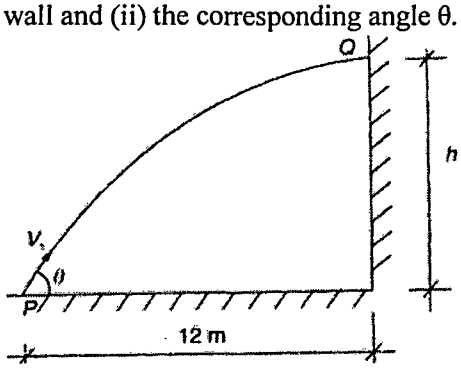

Fig. 15a-ii

[OR]

15 b) A block and pulley system is shown in Fig. 15b. The pulley is frictionless. Find the tension in the cable and the velocity of 50 kg block after it has moved to a distance of 1.5 m when the system starts from rest. Neglect the mass of the pulley. Take the coefficient of kinetic friction between the block and planes as 0.25. (16)

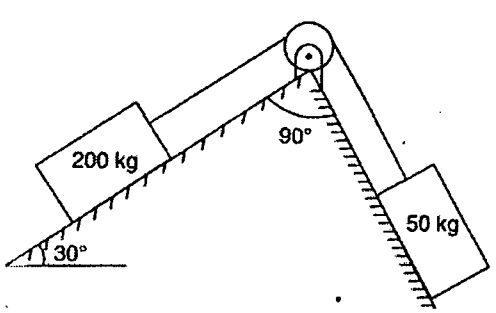

Fig. 15b