SEM 1 – 3 (RC)

F.E. (Semester – I) (RC) Examination, May 2010

BASIC CIVIL ENGINEERING AND ENGINEERING MECHANICS

Duration : 3 Hours | Total Marks : 100

Instructions : *1) Attempt **any five** questions with at least **one** question from **each** Module.*

*2) Figures to **right** indicate **full** marks.*

*3) **Make** suitable assumption **if necessary**.*

MODULE – I

1. a) With neat sketch describe various structural forms of steel. **8**

   b) What do you understand by FRP ? Explain its usage in field of construction. **5**

   c) Give a general classification of bridges. With neat sketch explain any one type of RCC bridge. **7**

2. a) Write notes on : **8**

      i) Aluminium as a building material

      ii) Grades of concrete.

   b) Describe the various components of super structure of a building. **8**

   c) What you generally study in hydraulic branch of Civil Engineering ? **4**

MODULE – II

3. a) State and prove LAMI's theorem. **4**

P.T.O.

b) Replace the 200 N force at point A by an Equivalent force and couple at B. Refer Fig. **3**

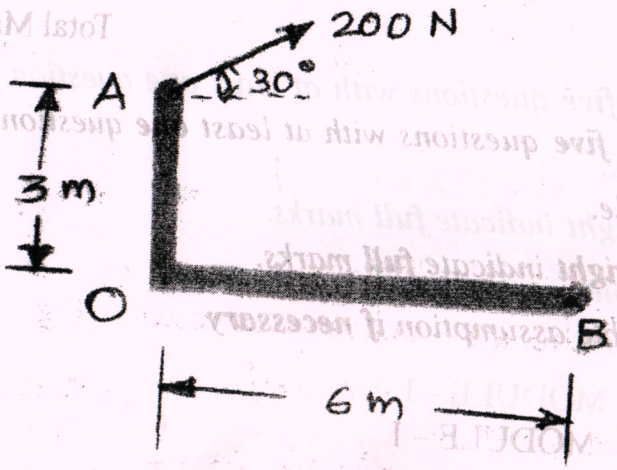

Fig. 3 (b)

c) Find the Resultant of the force system acting on a body ABCD as shown in Fig. and locate it from point B. Also find X and Y intercept made by the resultant. **10**

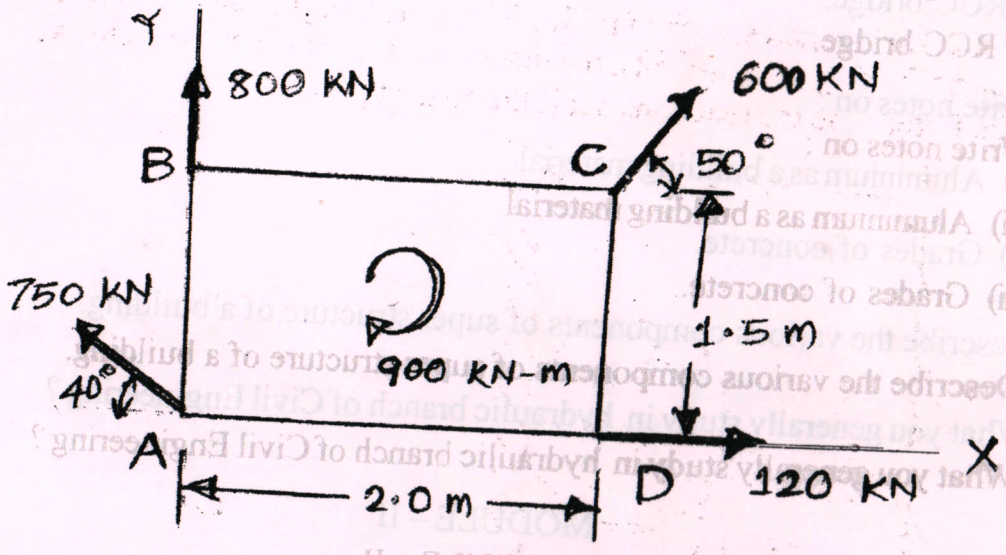

Fig. 3 (c)

d) A Block rests on a horizontal plane with the forces acting on it as shown in Fig. – Determine forces F and N for Equilibrium. 3

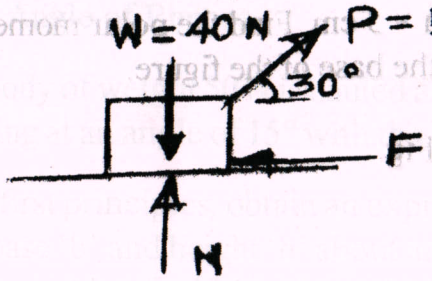

Fig. 3 (d)

4. a) Distinguish between "Resultant" and "Equilibriant". 2

b) Determine the support reactions for the beam loaded as shown in Fig. 10

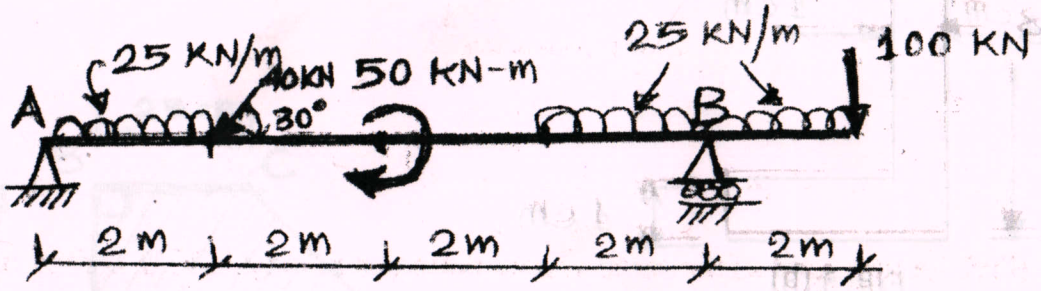

Fig. 4 (b)

c) Two smooth spheres, each of radius 30 cm and weight 400 N, rest in a horizontal channel having vertical walls, the distance between which is 90 cm : as shown in Fig. Determine the reactions at all the contact points. 8

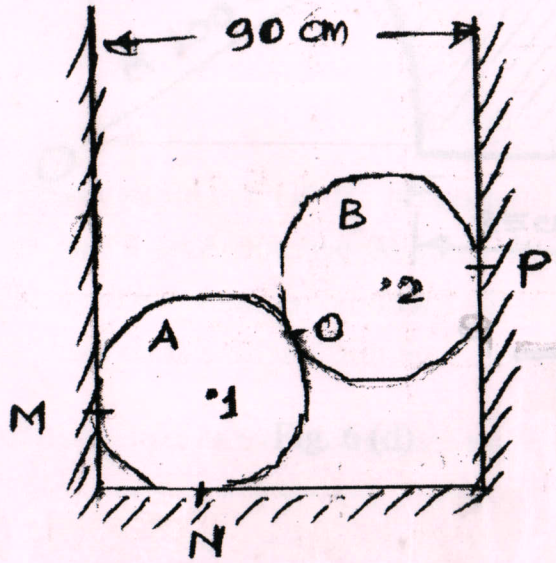

Fig. 4 (c)

MODULE – III

5. a) A hollow square cross section consists of an 8 cm × 8 cm square from which is subtracted concentrically located square 5 cm × 5 cm. Find the polar moment of Inertia. Also find moment of Inertia about the base of the figure. **6**

b) Find the centroid for a [– section shown in Fig. **6**

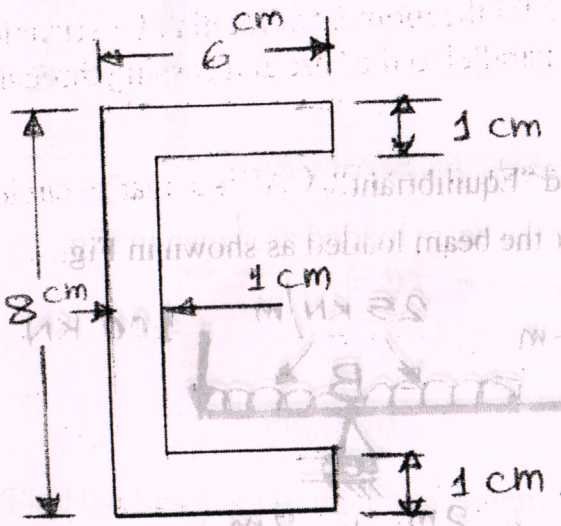

Fig. 5 (b)

c) A Block weighing 10 KN is to be raised against a surface, which is inclined at 60° with the horizontal by means of a 15° wedge as shown in Fig. Find the horizontal force P which will just start moving the block, if the coefficient of friction between all the surfaces of contact is 0.2. **8**

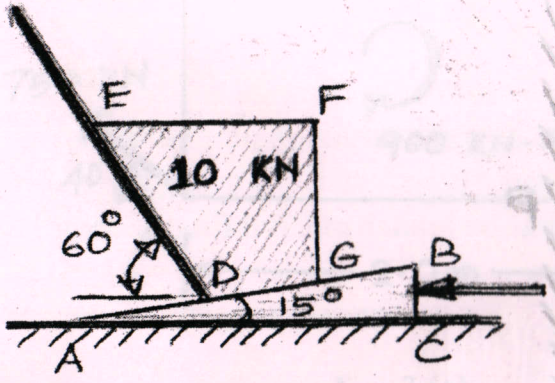

Fig. 5 (c)

6. a) Define: 2

i) Limiting Friction

ii) Angle of Repose.

b) A body of weight 50 N is hauled along a rough horizontal plane by a pull of 18 N acting at an angle of 15° with the horizontal. Find the coefficient of friction. 4

c) By first principles, obtain an expression for the moment of Inertia of a Triangle of base 'b' and height 'h' about an axis parallel to the base and passing through the c.g. Also find M.I. about the base. 6

d) Determine the centroid of the shaded area shown in Fig. OAF is a quarter circle of radius 100 cm. 8

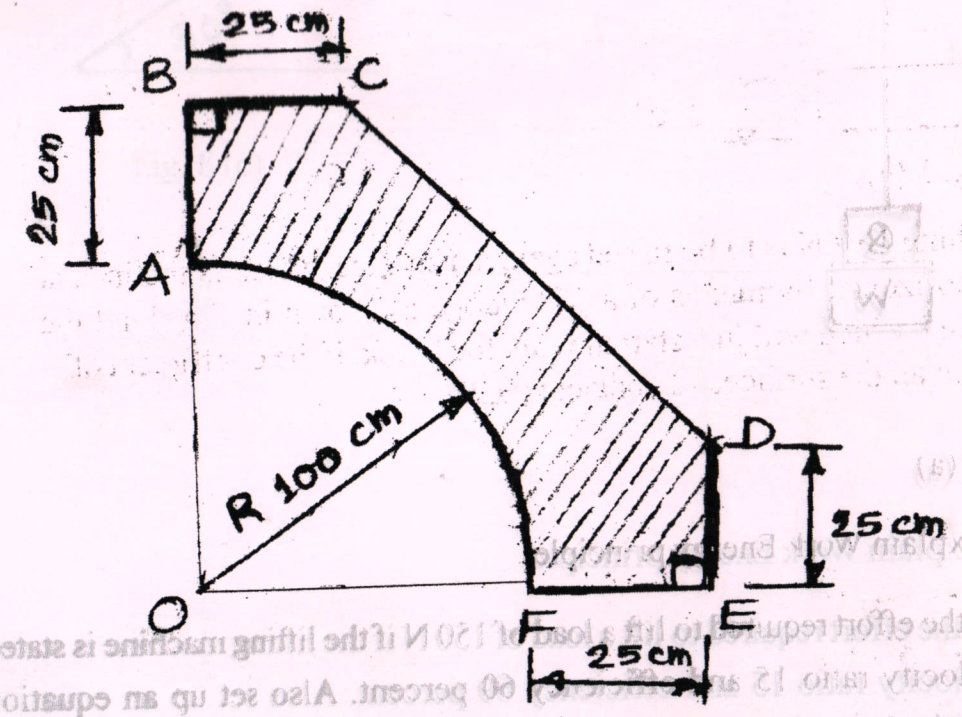

Fig. 6 (d)

MODULE – IV

7. a) Two equal weights W and a single weight Q are connected to the ends of a flexible but inextensible cord overhanging a pulley as shown in fig below. If system moves with constant acceleration 'a', derive an expression for magnitude of Q. **8**

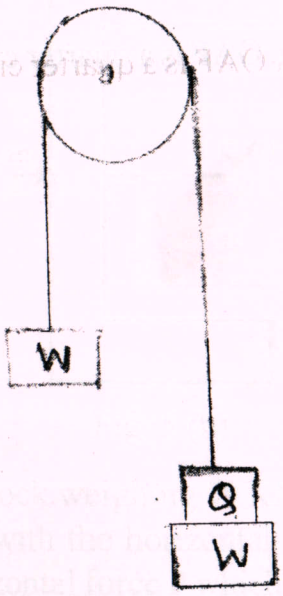

Fig. 7 (a)

b) State and explain Work Energy principle. **4**

c) Determine the effort required to lift a load of 150 N if the lifting machine is stated to have velocity ratio 15 and efficiency 60 percent. Also set up an equation prescribing the Law of machine if the frictional resistance of the machine is constant. Proceed to find the effort to run this machine at no load. **8**

8. a) Draw a neat sketch of single purchase crab and derive an expression for velocity ratio. **8**

b) In a differential wheel and axle arrangement, the diameter of the wheel is 15 cm and that of the axles are 8 cm and 5 cm. If the efficiency of the machine is 80%. Calculate the effort required to lift a load of 300 N. Also calculate the number of revolutions the machine would make in lifting the load through a distance of 25 cm. **8**

c) A box of 60 N weight is pulled up along a 30° plane by applying a 50 N force as shown in fig below. The box starts from rest and the surface of plane is smooth. What speed the box will attain after travelling 3 m up the plane ? **4**

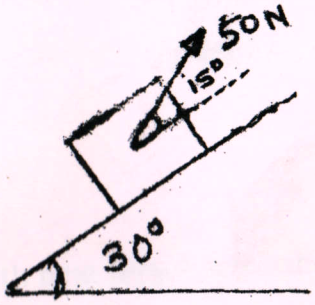

Fig. 8 (c)