F.E. (Semester – I) (Revised in 2007-08) Examination, May/June 2014
BASIC CIVIL ENGG. AND ENGG. MECHANICS

Duration : 3 Hours | Total Marks : 100

Instructions : 1) *Attempt **any five** questions with atleast **one** question from **each** Module.*
2) ***Make** suitable assumptions if **necessary** and state them **clearly**.*

MODULE – I

1. a) Define reinforced cement concrete and give an account of its ingredients. Also explain why there is need for compaction and curing of concrete. **10**

   b) Write notes on (**any two**) : **(5+5)**
      i) Components of Road
      ii) Load bearing structure and Framed structure
      iii) Scope of Geotechnical field of Civil Engineering.

2. a) Give general classification of bridges. Describe any two types of bridges with neat sketches. **10**

   b) What do you mean by FRP ? Explain its usage as building material. **5**

   c) Describe combined footing and also explain when such type of footing is generally adopted. **5**

MODULE – II

3. a) Three co-planar forces act at a point as shown. Determine the value of angle "θ" such that the resultant of all the three forces is vertical. Find the magnitude of the resultant. **4**

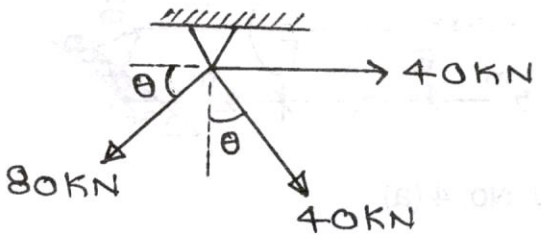

Fig. Q. No. 3 (a)

b) Replace the given force system into a single force and a couple acting at A. 6

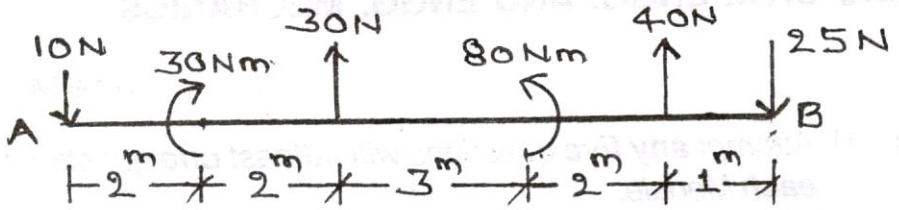

Fig. Q. No. 3 (b)

c) A triangular plate ABC is subjected to four co-planar forces as shown. Find the resultant and locate its position with respect to point A. 10

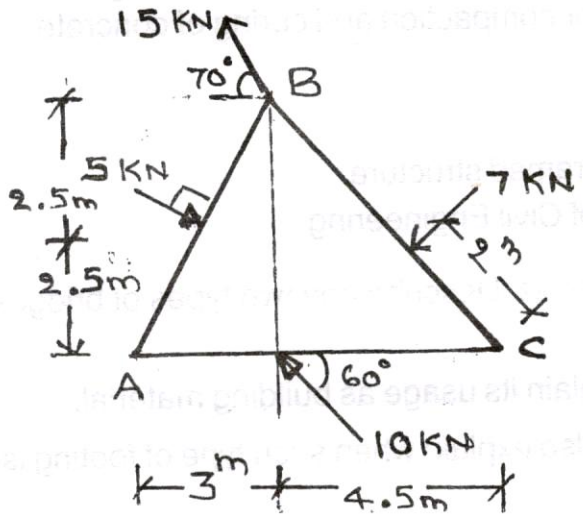

Fig. Q. No. 3 (c)

4. a) Determine the support reactions for the beam 8

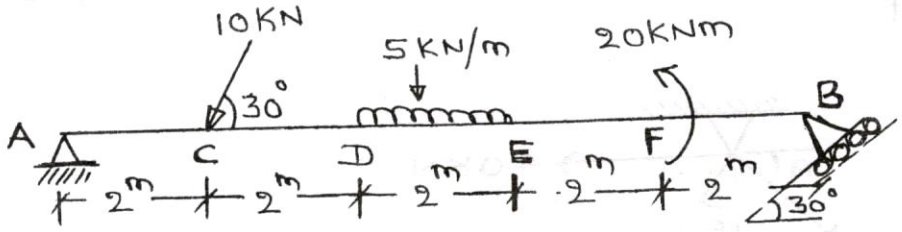

Fig. Q. No. 4 (a)

b) Two smooth spheres each weighing 100 N and radius 250mm are in equilibrium in a channel section as shown. Find the reactions at all the contacting points A, B, C and D assuming all the surfaces to be smooth. 12

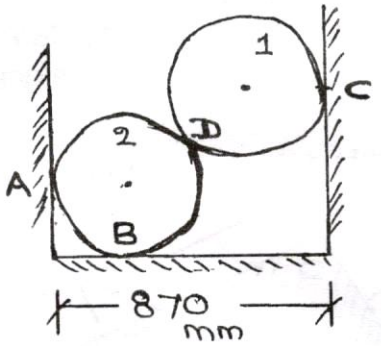

Fig. Q. No. 4 (b)

MODULE – III

5. a) Determine the position of centroid of the shaded area with reference to axes shown. All the dimensions are in MMS. 8

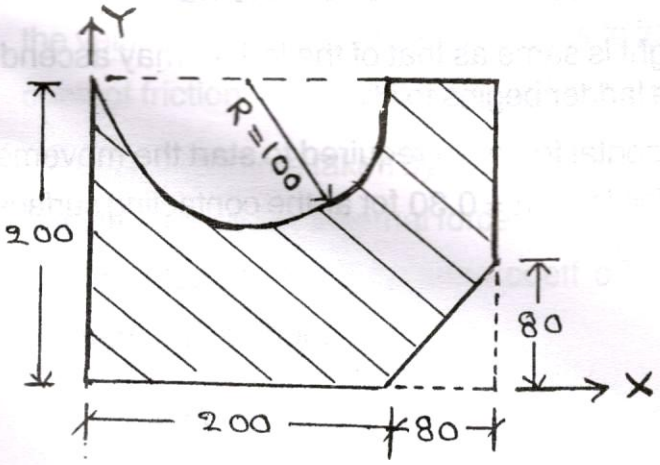

Fig. Q. No. 5 (a)

b) Determine polar moment of inertia of the shaded area about the point A for the figure shown. All the dimensions are in MMS. 12

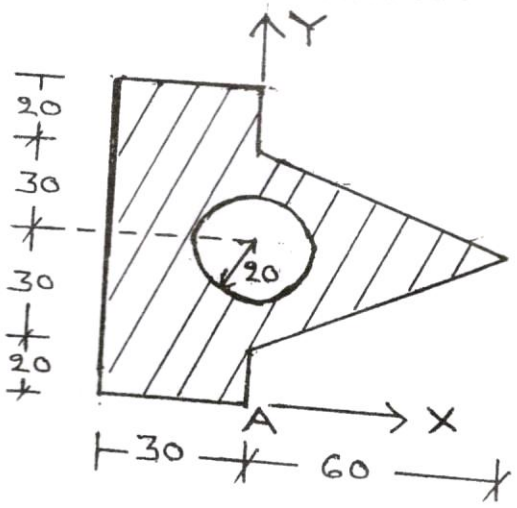

Fig. Q. No. 5 (b)

6. a) A uniform ladder of length "L", weighing "W" units rests against a vertical wall at an angle of 45° with the wall. Coeff of friction between ladder and the floor $\mu_1 = 0.6$ AND the coeff of friction between ladder and the wall = $\mu_2 = 0.40$.

Show that a man whose weight is same as that of the ladder may ascend a distance of 0.855L before the ladder begins to slip. 10

b) Determine the minimum horizontal force (P) required to start the movement of the block. Assume coeff of friction = $\mu = 0.30$ for all the contacting surfaces. Neglect the weight of the wedge. 10

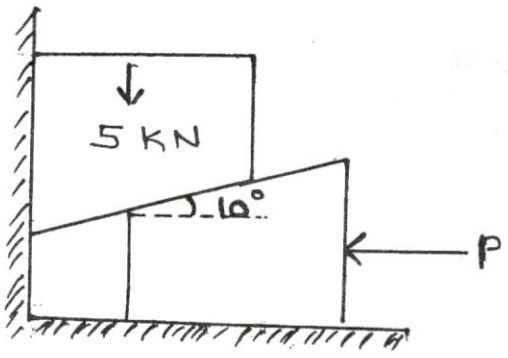

Fig. Q. No. 6 (b)

MODULE – IV

7. Solve **any two** of the following :

a) For the system shown, determine acceleration of the system and also tension in the rope. What is the velocity of the system after 10 seconds starting from the rest. The coeff of friction for both the planes is 0.30. Use D'Alembert's principle. **10**

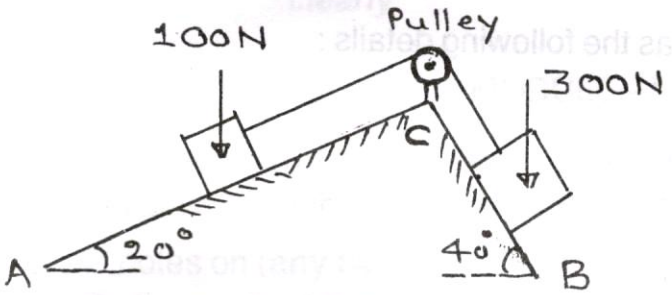

Fig. Q. No. 7 (a)

b) A block weighing 2 kN is pushed up an inclined plane by 8m starting from rest, by applying a force of 2 kN. The force is applied parallel to the plane. The plane is inclined at 40° with the horizontal. Then the force of 2 kN is removed. Find the velocity of the block when it returns to its original position. Assume coeff of friction = $\mu = 0.30$. Use "WORK ENERGY" principle. **10**

c) Determine the time taken by the block to attain a velocity of 10 m/sec starting from the rest. If the external force of 2 kN is then removed, how much further will the block move ? Assume coeff of friction = $\mu = 0.25$. Use "Impulse Momentum" method. **10**

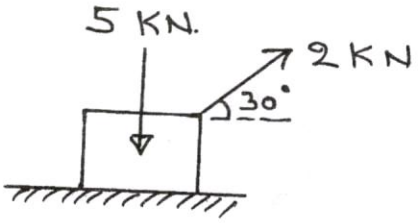

Fig. Q. No. 7 (c)

8. a) In a simple lifting machine, an effort of 80 N lifted a load of 125 N, AND an effort of 85N lifts a load of 185N. If the velocity ratio is 20, determine
   i) Law of machine
   ii) Efficiency of the machine at 125 N load
   iii) Effort lost in friction when the load of 125N is lifted
   iv) Maximum mechanical advantage
   v) Maximum efficiency. **10**

   b) A single purchase winch crab has the following details : **10**

   No. of teeth on pinion = 12

   No. of teeth on spur wheel = 96

   Length of lever = 700 mm

   Diameter of load axle = 200 mm.

   An effort of 6N lifts a load of 180N AND an effort of 12N lifts a load of 396N. Find :
   i) Law of machine
   ii) Efficiency of the machine in both the cases.