SEM 1-3

F.E. (Semester – I) (RC) Examination, Nov./Dec. 2013
BASIC CIVIL ENGINEERING AND ENGINEERING MECHANICS

Duration : 3 Hours | Total Marks : 100

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

*2) Make suitable assumptions **if necessary** and state them clearly.*

MODULE – I

1. a) Distinguish between load bearing structures and framed structure. **5**

   b) Give general classification of bridges. Describe suspension bridge with a neat sketch. **9**

   c) Give scope of the following fields of civil engineering :

      i) Structural Engineering

      ii) Fluid Mechanics and Hydraulics. **6**

2. a) Write notes on :

      i) Ready mix concrete

      ii) Workability of concrete. **(5+5)**

   b) With neat sketches describe any two forms of structural steel. **6**

   c) Give general classification of roads. **4**

P.T.O.

MODULE – II

3. a) Replace the given force system into a single force and couple acting at "A". 4

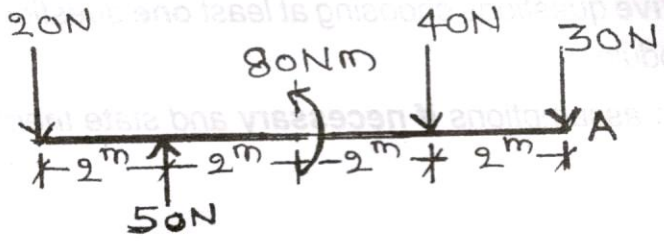

Fig. Q. No. 3(a)

b) A force R = 25 KN acting at a point as shown has three components, F_A, F_B and F_C. If F_C = 20 KN, find the magnitudes of F_A and F_B. 4

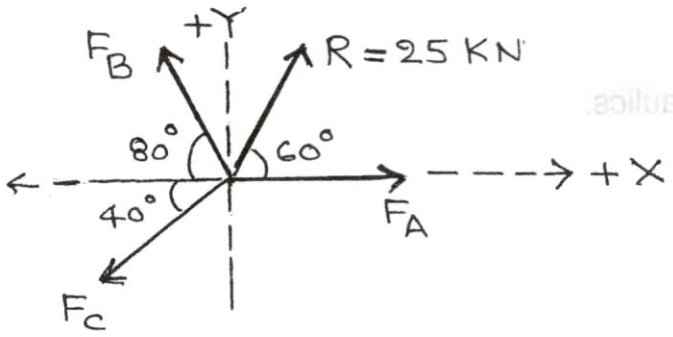

Fig. Q. No. 3(b)

c) A vertical pole is anchored in concrete foundation. Three wires are attached to the pole as shown. If the reactions at A are as shown, determine the forces in all the three wires. **12**

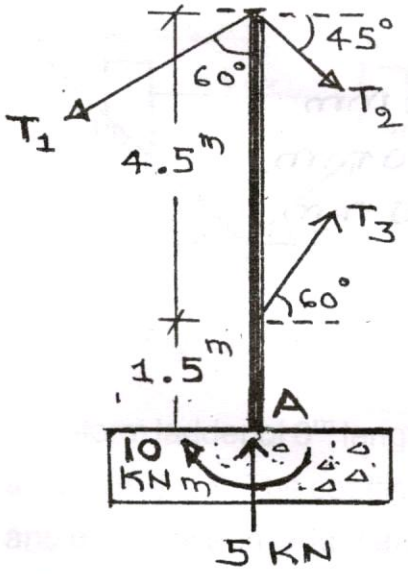

Fig. Q. No. 3(c)

4. a) Determine the support reactions for the beam shown : **10**

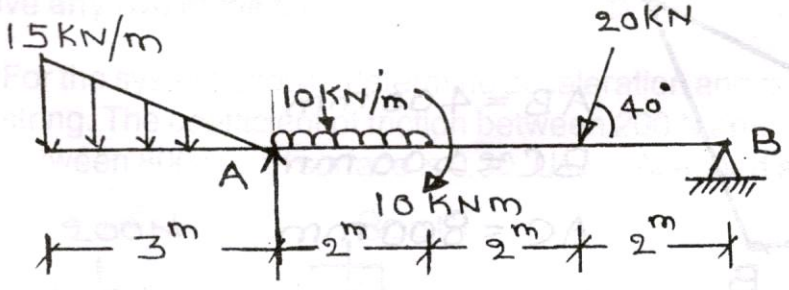

Fig. Q. No. 4(a)

b) Determine the tensions in the strings AC and BC when a load of 35 KN is suspended as shown : 10

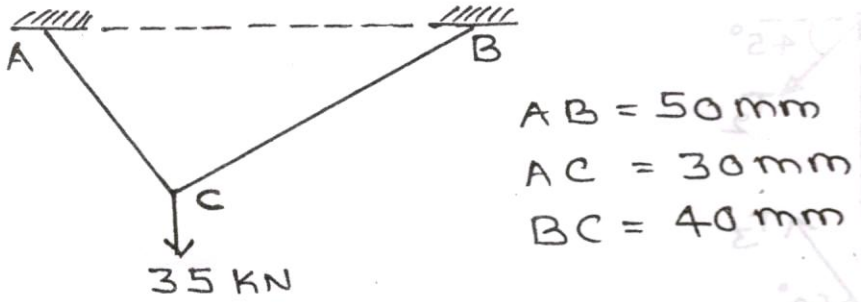

Fig. Q. No. 4(b)

MODULE – III

5. Determine the moment of inertia of a plane triangular lamina shown about both the centroidal axes and then polar moment of inertia about point A. 20

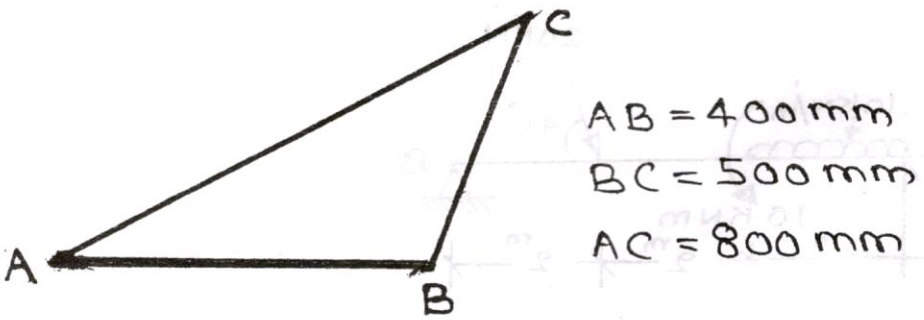

Fig. Q. No. 5

6. a) Two loads W_1 = 1 KN and W_2 resting on two inclined rough planes are connected by a horizontal bar as shown. Find the minimum and maximum values of load "W_2" for which the equilibrium can exist. Assume the angle of friction for both the planes as 20°. **10**

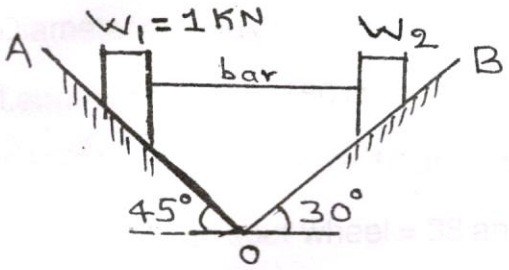

Fig. Q. No. 6(a)

b) A uniform ladder of 8^m length rests against a vertical wall with which it makes an angle of 45°. The coefficient of friction between the wall and ladder is 0.40 and that between ladder and floor is 0.50. If a man, whose weight is one half of that of the ladder ascends, how high will the man be there when the ladder slips ? **10**

MODULE – IV

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

a) For the system shown, determine acceleration and tension in the connecting string. The coefficient of friction between 200 N and surface is 0.20 and that between 800 N and surface is 0.30. Use D'Alembert's principle. **10**

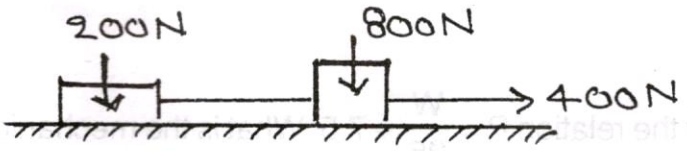

Fig. Q. No. 7(a)

b) Determine the distance covered by the block "A" to attain a velocity of 3m/sec. starting from rest. Assume pulley is smooth and coefficient of friction = $\mu = 0.20$. Use "Work Energy" principle. **10**

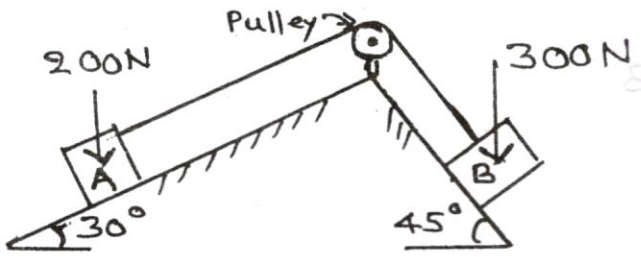

Fig. Q. No. 7(b)

c) The system has a rightward velocity of 3m/sec. Determine its velocity after 5 seconds. Assume coefficient of friction as 0.20 for all contacting surfaces. Use "Impulse Momentum" method. **10**

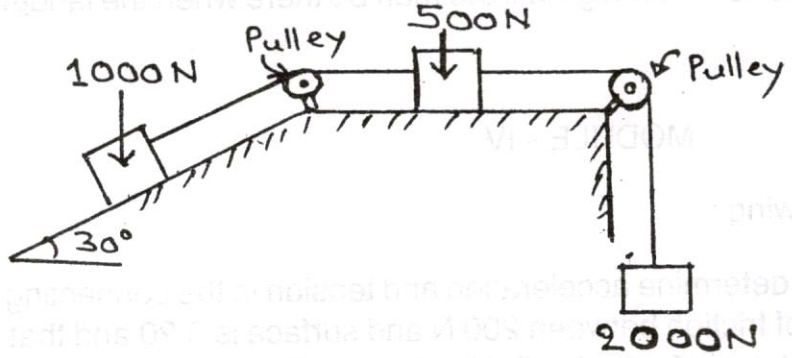

Fig. Q. No. 7(c)

8. a) The law of machine is given by the relation $P = \frac{W}{25} + 7.5$. What is the mechanical advantage and efficiency of the machine, when the load is 2000 N and velocity ratio is 40. Determine maximum efficiency of the machine. Also find out the effort lost in friction at this load of 2000 N. **6**

b) In a differential wheel and axle, an effort of 6 N raised a load of 60 N. If the efficiency at this load is 80%, find the velocity ratio of the machine. If the diameter of the effort wheel is 300 mm and the sum of diameters of the axles is 280 mm, determine the diameter of each axle. **4**

c) A double purchase winch crab has following dimensions :

Diameter of load drum = 80 mm

Length of handle = 180 mm

No. of teeth on pinions = 10 and 15

No. of teeth on spur wheel = 38 and 45.

It was found that an effort of 45 N lifted a load of 900 N and an effort of 68 N lifted a load 1575 N. Determine :

i) Law of machine

ii) Effort required to lift a load of 2250 N

iii) Efficiency of the machine in the above case. **10**
