F.E. (Semester – I) (RC 07-08) Examination, November/December 2016

BASIC CIVIL ENGINEERING & ENGINEERING MECHANICS

Duration : 3 Hours | Total Marks : 100

Instructions : *1) Attempt **one** question from **each** Module and totally **five** questions.*

*2) Assume **any** data if required and state them **clearly**.*

MODULE – I

1. a) Write short notes on **any two** : **10**

   i) Water resource and irrigation engineering.

   ii) Structural engineering

   iii) Hydraulics in civil engineering.

   b) Describe classification of Roads. Briefly mention about components of roads and their functions. **10**

2. a) Write short notes on **any two** : **10**

   i) Curing of concrete

   ii) Arch Bridges

   iii) Water cement ratio and workability of concrete.

   b) With the help of neat sketches describe any three market available forms of steel sections. **10**

P.T.O.

MODULE – II

3. a) Determine the reactions at all the four points of contact for the two spheres placed as shown. The radius of spheres A and B are 250 mm and 200 mm resp. 14

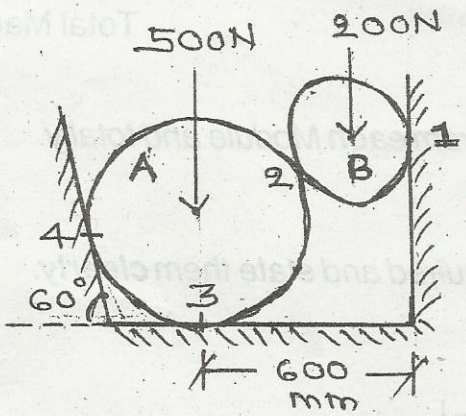

Fig. Q. No. – 3 (a)

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

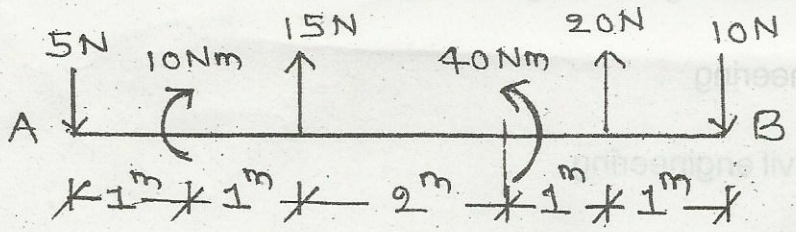

Fig. Q. No. – 3 (b)

4. a) Determine the reactions for beam loaded as shown. 8

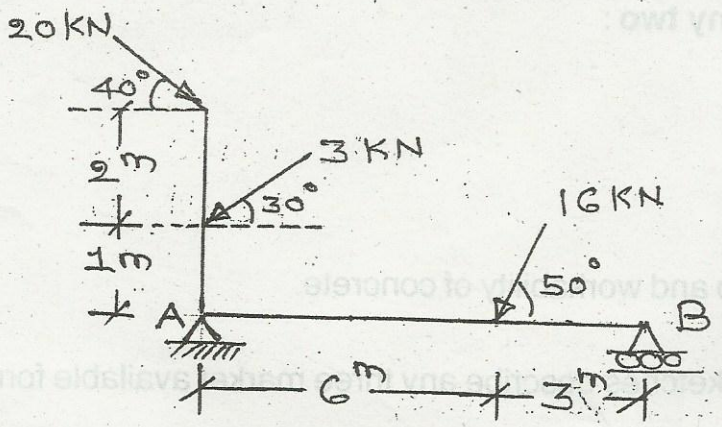

Fig. Q. No. – 4(a)

b) Determine the forces in various segments of the cable loaded as shown : 8

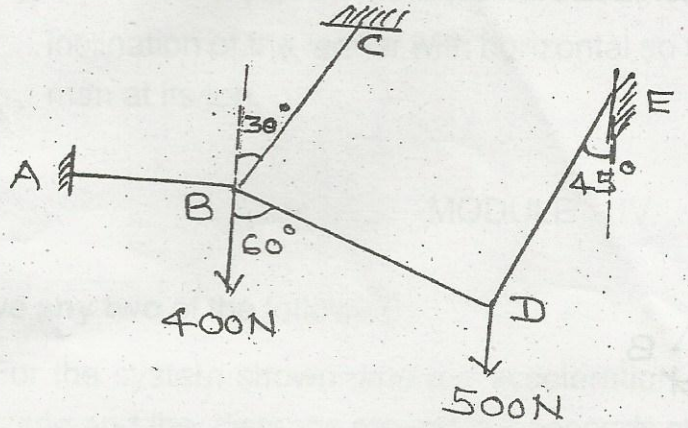

Fig. Q. No. – 4(b)

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

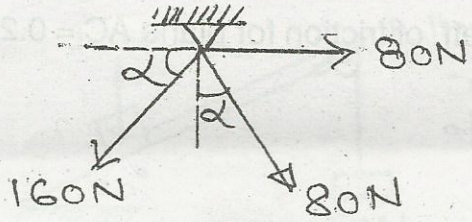

Fig. Q. No. – 4(c)

MODULE – III

5. a) Determine the position of centroid of the shaded area with reference to axes shown. All the dimensions are in mms. 10

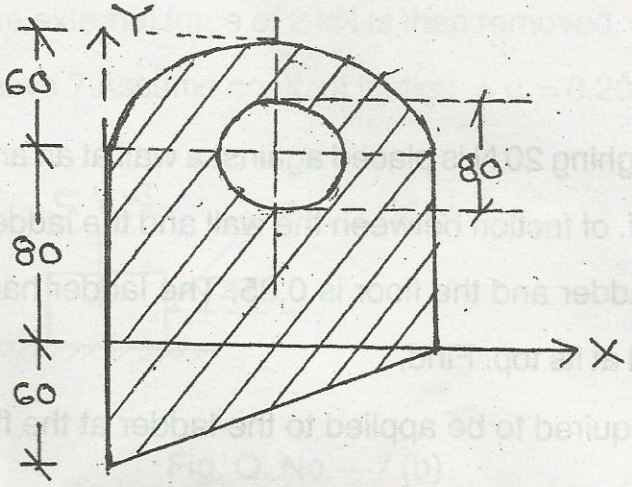

Fig. Q. No. – 5(a)

b) Determine the moment of inertia about both the centroidal axes for the plane lamina shown. **10**

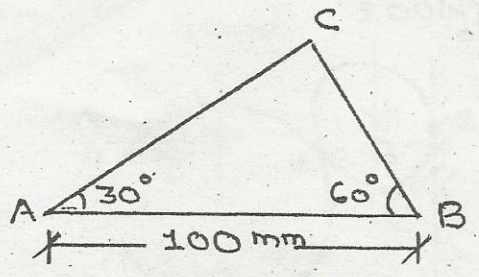

Fig. Q. No. – 5(b)

6. a) Determine the minimum and maximum values of the load "W" for the equilibrium of the system. Assume the coeff. of friction for plane AC = 0.25 and that for plane BC = 0.28. **10**

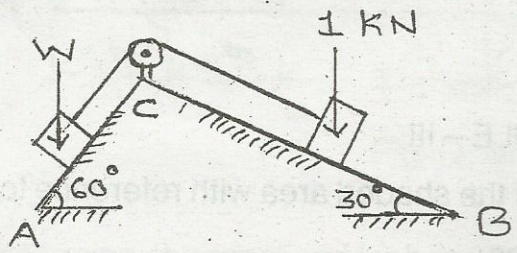

Fig. Q. No. – 6(a)

b) A uniform ladder 3 m long, weighing 20 N is placed against a wall at an angle of 60° with the floor. The coeff. of friction between the wall and the ladder is 0.25 AND that between the ladder and the floor is 0.35. The ladder has to support a man weighing 100 N at its top. Find,

i) The horizontal force [P] required to be applied to the ladder at the floor level to prevent slipping.

ii) If the force (P) is not applied, what must be the minimum angle of inclination of the ladder with horizontal so that there is no slip, with the man at its top. **10**

MODULE – IV

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

a) For the system shown, find the acceleration of the system, tension in the string and the distance moved in 3 seconds starting from rest. Assume coeff. of friction = μ = 0.20.

Use D'Alembert's principle. **10**

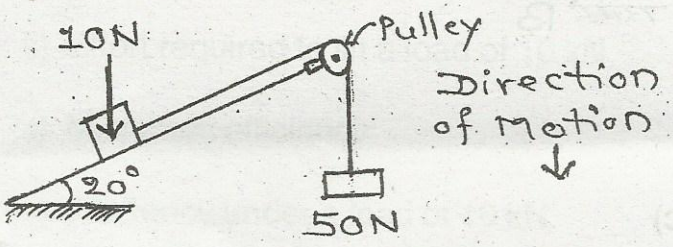

Fig. Q. No. – 7 (a)

b) Determine the velocity of the block after it moves 30 m starting from rest. If the external force of 2 kN is then removed, how much further will the block move ? Assume coeff. of friction = μ = 0.20. Use "Work Energy" method. **10**

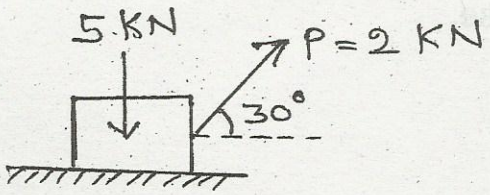

Fig. Q. No. – 7 (b)

c) Determine the time required for the system shown to attain a velocity of 10 m / sec starting from rest. What is the magnitude of the tension in the string. Assume the coeff. of friction = μ = 0.20 for all contacting surfaces. Use "Impulse Momentum Equation". **10**

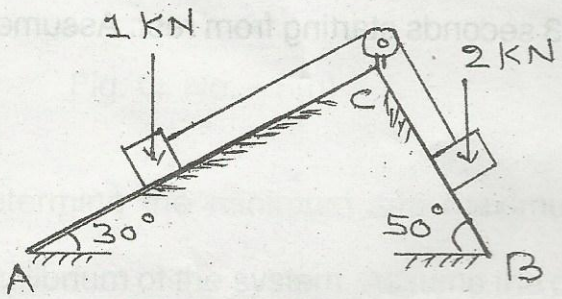

Fig. Q. No. – 7 c)

8. a) In a simple lifting machine a load of 2.4 kN was lifted by an effort of 150 N AND a load of 3 kN was lifted by an effort of 180 N. If the velocity ratio is 30, determine : **10**

i) Law of machine.

ii) Efficiency of the machine at a load of 2.4 kN.

iii) Effort lost in friction in the above case.

iv) Maximum Mechanical Advantage

v) Maximum efficiency.

b) A double purchase crab has the following details **10**

Effective diameter of load drum = 320 mm

Length of the handle = 720 mm

No. of teeth on pinions = 40 and 60

No. of teeth on spur wheels = 150 and 180

It was found that an effort of 180 N was required to lift a load of 3600 N. In the same machine, an effort of 270 N liftted a load of 6300 N. Determine :

i) Law of machine

ii) Effort required to lift a load of 10 kN

iii) Maximum efficiency

iv) Efficiency under a load of 10 kN.
