SEM 1 – 3

F.E. (Semester – I) Examination, May/June 2013
BASIC CIVIL ENGG. AND ENGG. MECHANICS
(Revised Course 2007-08)

Duration : 3 Hours | Total Marks : 100

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

*2) **Assume** any data **if required**.*

MODULE – I

1. A) Write short notes on **any 2** : **(5×2=10)**

   a) Water resource and irrigation engineering, Fluid Mechanics.

   b) Use of alluminium as building material.

   c) Use of FRP as building material.

   B) With the help of neat sketches describe various components of roads. **10**

2. A) What are load bearing and framed structures ? State their advantages and disadvantages. **8**

   B) Write short notes on **any 3** : **(4×3=12)**

   a) Curing of concrete

   b) Water cement ratio and workability

   c) Suspension bridges

   d) Arch bridges.

P.T.O.

MODULE – II

3. a) Two identical rods PQ and RS are welded perpendicular to each other forming a Tee as shown. Calculate the angle "θ" for the equilibrium of the given force system. 8

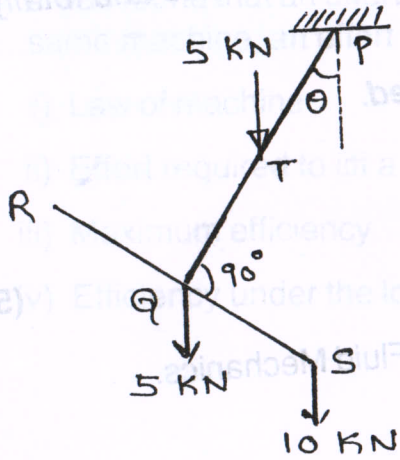

Fig. Q. No. – 3 (a)

b) Determine the magnitude of the force "P" to be applied at 'C' to make the resultant of all the given forces inclusive "P" to pass through point A. 6

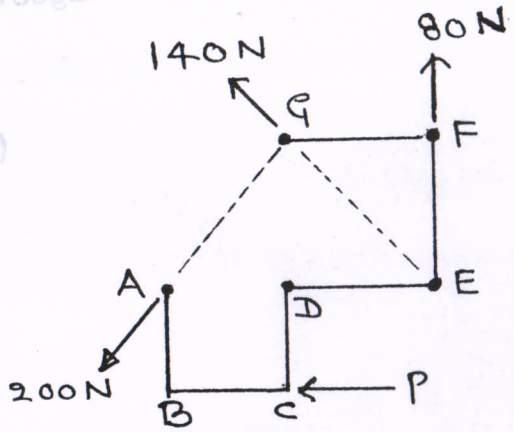

Fig. Q. No. – 3 (b)

c) Determine the value of "θ" for the reaction at B to be minimum. Determine the corresponding reactions. 6

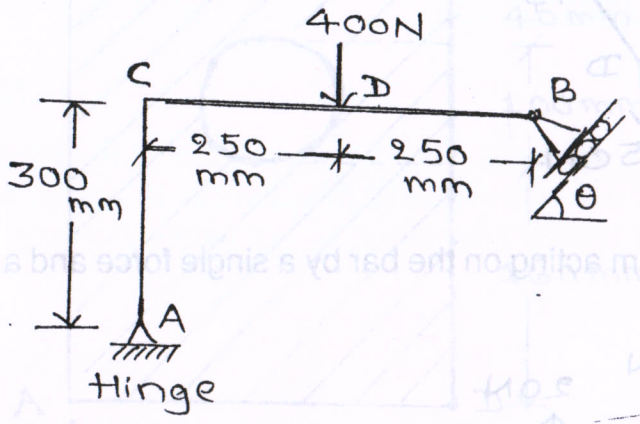

Fig. Q. No. – 3 (c)

4. a) Determine the reactions for the beam loaded as shown. The beam is hinged at A. 6

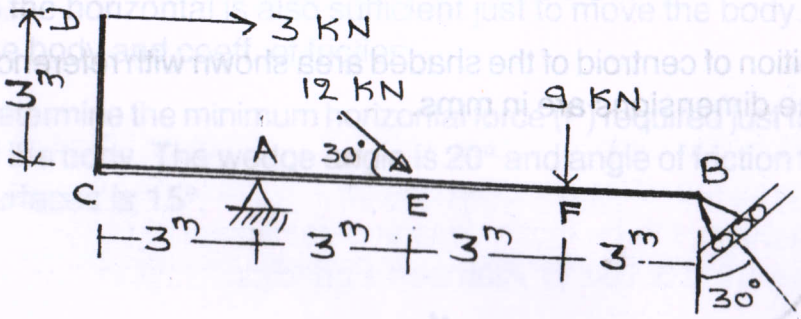

Fig. Q. No. – 4 (a)

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

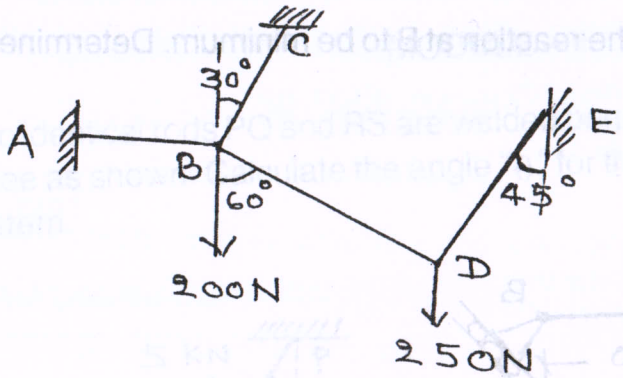

Fig. Q. No. – 4 (b)

c) Replace the given force system acting on the bar by a single force and a couple acting at B. **6**

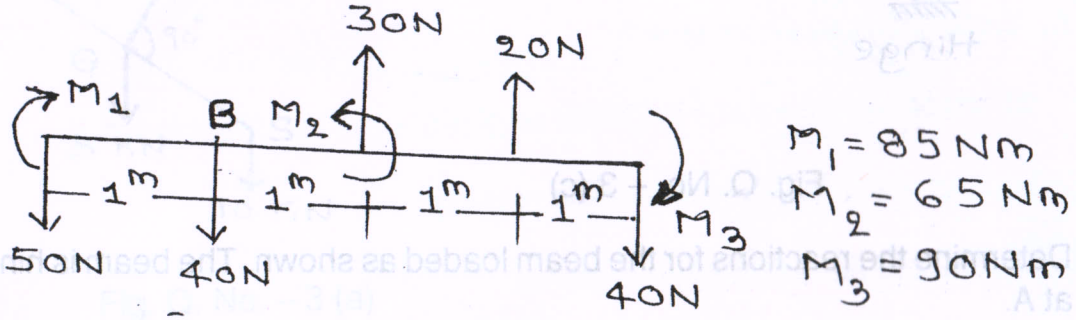

Fig. Q. No. – 4 (c)

MODULE – III

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

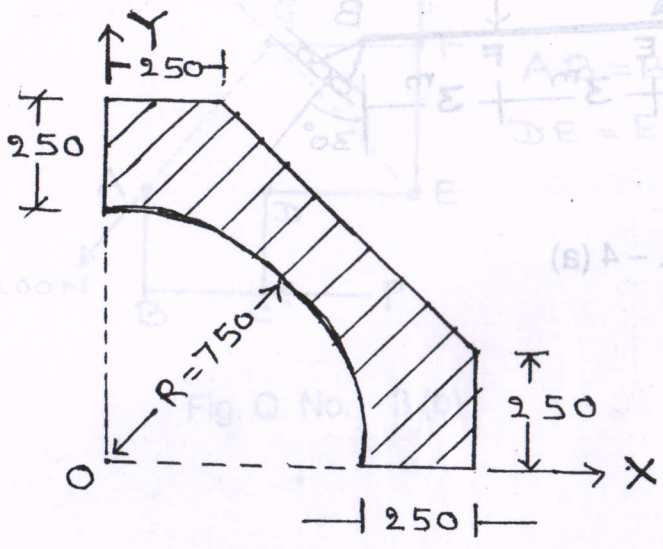

Fig. Q. No. – 5 (a)

b) Find the moment of Inertia about both the centroidal axes and hence calculate the polar moment of inertia about point A. **12**

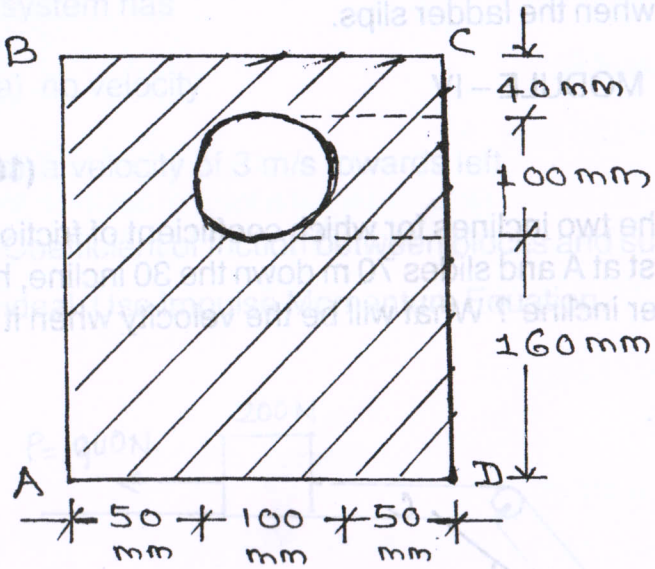

Fig. Q. No. – 5 (b)

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

a) A body resting on a rough horizontal plane requires a pull of 18 kN at 30° to the horizontal just to move the body. It was found that a push of 22 kN at 30° to the horizontal is also sufficient just to move the body. Find the weight of the body and coeff. of friction. **10**

b) Determine the minimum horizontal force (P) required just to start the movement of the body. The wedge angle is 20° and angle of friction for all contacting surfaces is 15°. **10**

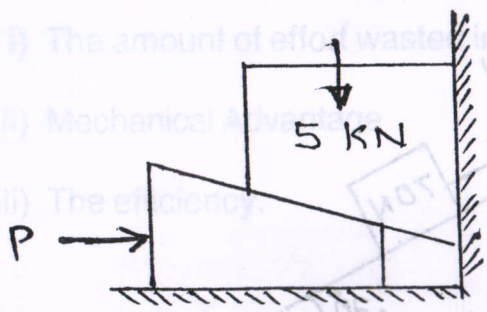

Fig. Q. No. – 6 (b)

c) A uniform ladder 7^m long, weighing 100 N, is placed against a wall making an angle of 45° with the floor. The coeff. of friction between the wall and the ladder is 0.40 and that between the floor and the ladder is 0.50. A man weighing 50 N ascends the ladder. How high will the man be there [distance measured along the ladder] when the ladder slips. **10**

MODULE – IV

7. Attempt **any two** : **(10×2=20)**

a) A 800 N body moves along the two inclines for which coefficient of friction is 0.2. If the body starts from rest at A and slides 70 m down the 30 incline, how far will it move along the other incline ? What will be the velocity when it returns to B. **10**

Use "Work Energy" principle.

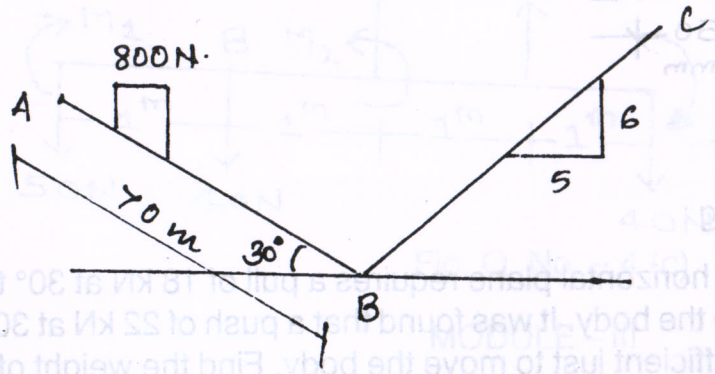

Fig. Q. No. – 7(a)

b) Find the acceleration and tension in the string of the system shown in the figure. Also determine the velocity of the system in 5 seconds after starting from rest. Assume pulleys to be frictionless and coefficient of friction for all contact surfaces as $\mu = 0.3$. Use D' Alembert's principle. **10**

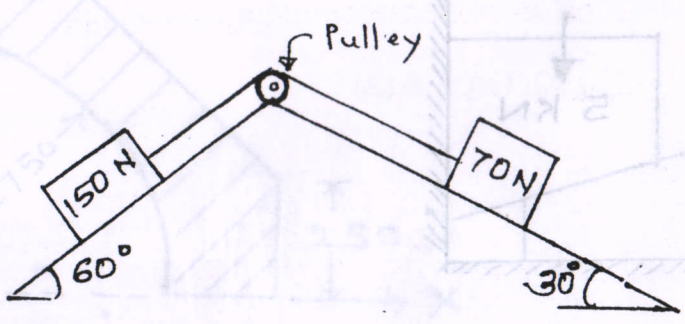

Fig. Q. No. – 7(b)

c) Force P = 1900 N shown in figure was applied to 200 N, block when the block was moving with rightward velocity of 5 m/s. Determine the time at which the system has

a) no velocity

b) a velocity of 3 m/s towards left.

Coefficient of friction between blocks and surface = 0.2. Assume pulley to be ideal. Use Impulse Momentum Equation. **10**

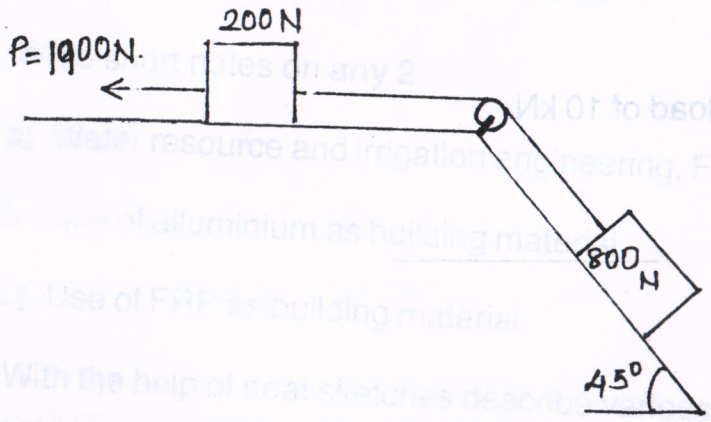

Fig. Q. No. – 7(c)

8. a) In a machine loads of 2400 N and 3000 N are raised by applying efforts of 150 N and 180 N resp. Find the law of machine and calculate the load that could be lifted by an effort of 200 N. Also calculate :

i) The amount of effort wasted in overcoming the friction

ii) Mechanical Advantage

iii) The efficiency. **8**

b) A double purchase winch crab has the following details :

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 was required to lift a load of 6300 N. Find

i) Law of machine

ii) Effort required to lift a load of 10 kN.

iii) Maximum efficiency

iv) Efficiency under the load of 10 kN. **12**