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SEM 1-3 (RC 07-08)

F.E. (Sem. – I) (Revised in 2007-08) Examination, Nov./Dec. 2012
BASIC CIVIL ENGG. AND ENGG. 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**.*

MODULE – I

1. A) Write short notes on **any 2** : **(5×2=10)**
   a) Surveying and levelling, soil mechanics
   b) RMC and SCC
   c) Isolated and combined footing.
   B) Describe classification of roads. Briefly mention about components and their functions. **10**

2. A) With the help of neat sketches describe any three market available forms of steel. **10**
   B) Describe suspension and arch bridges, with neat sketches. Also mention advantages and limitations. **10**

MODULE – II

3. a) Two bars AB and BC of lengths 1^m and 2^m resp., are rigidly connected at B, and suspended by a string as shown. The loads 200 N and 400 N are acting at the mid-points of AB and BC resp. Find the angle "α" of the bar BC with the horizontal when the system is in equilibrium. **10**

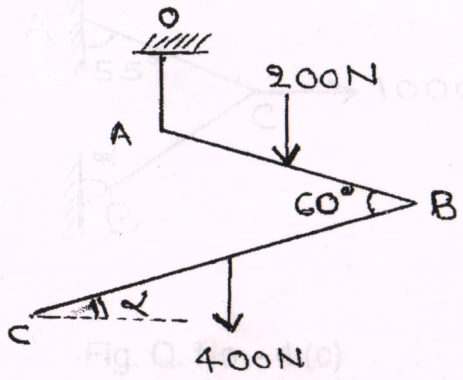

Fig. Q. No. – 3 (a)

P.T.O.

b) Find the magnitude of the force (p) if the force in member AC is 3 kN and that in member BC is 4.0 kN. **6**

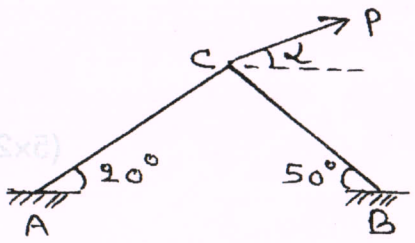

Fig. Q. No – 3 (b)

c) Determine the values of forces P_1 and P_2 when the resultant of the given force system is 800 N acting along positive xx axis. **4**

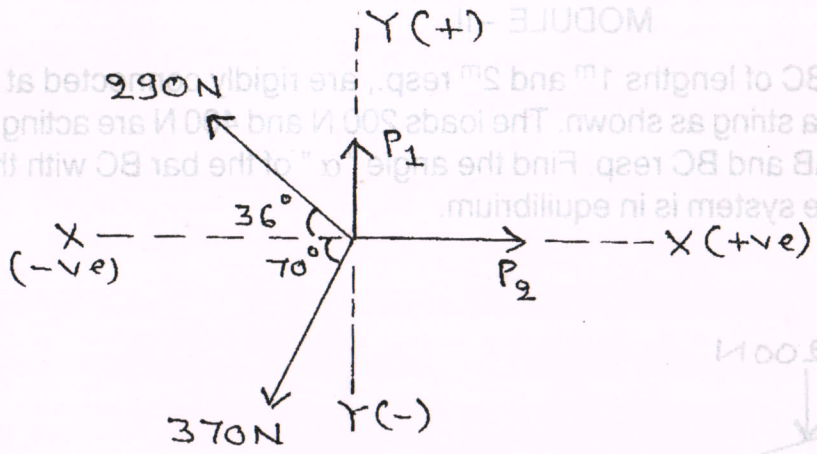

Fig. Q. No – 3 (c)

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

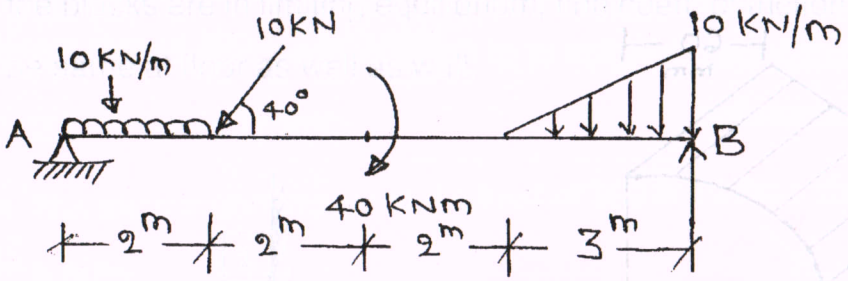

Fig. Q. No – 4 (a)

b) Determine the tensions in the strings AC and BC when a load of 50 kN is suspended at C, as shown **6**

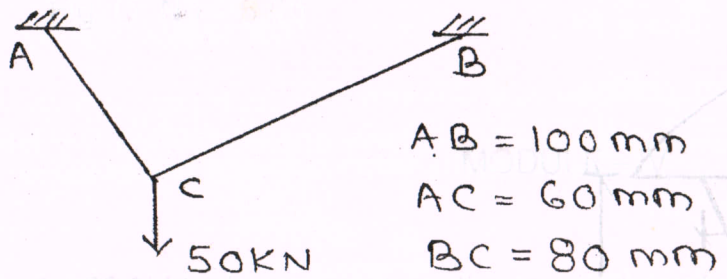

Fig. Q. No – 4 (b)

c) Determine the value of angle "α" for which the tension in the cable BC is minimum. Also determine the angle "α" for which the forces in the cables AC and BC are same. **6**

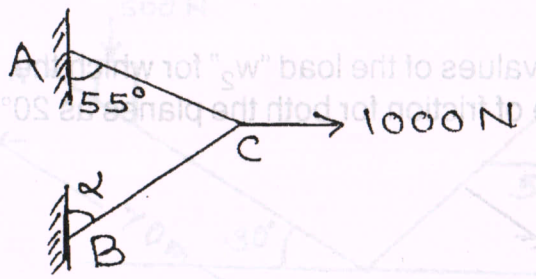

Fig. Q. No – 4 (c)

MODULE – III

5. a) Determine the position of centroid for the shaded area shown wrt axes shown **8**

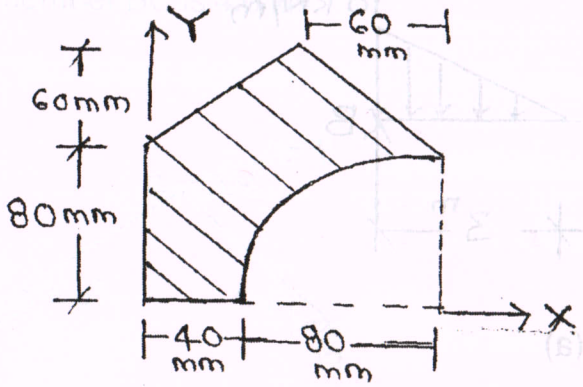

Fig. Q. No – 5 (a)

b) Determine moment of inertia about both centroidal axes for the plane figure shown **12**

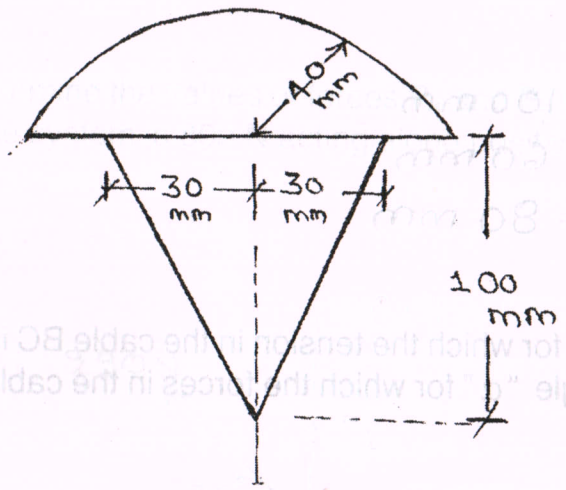

Fig. Q. No – 5 (b)

6. a) Determine minimum and maximum values of the load "w_2" for which the equilibrium can exist. Assume angle of friction for both the planes as 20°. **10**

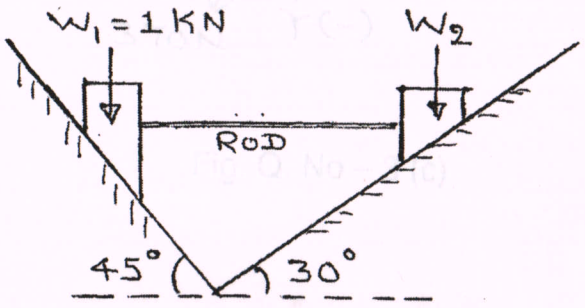

Fig. Q. No – 6 (a)

b) Two identical blocks of weights "w" are supported by a rod as shown. If both the blocks are in limiting equilibrium, find coeff. of friction, assuming it to be same at floor as well as wall. **10**

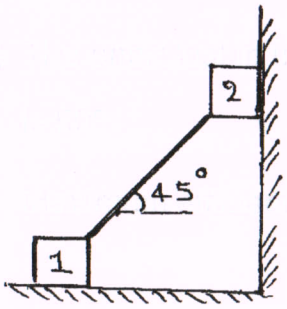

Fig. Q. No – 6 (b)

MODULE – IV

7. a) A 600 N block 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 the body move along the other plane ? What will be the velocity when it returns to B ? Use Work Energy Principle. **10**

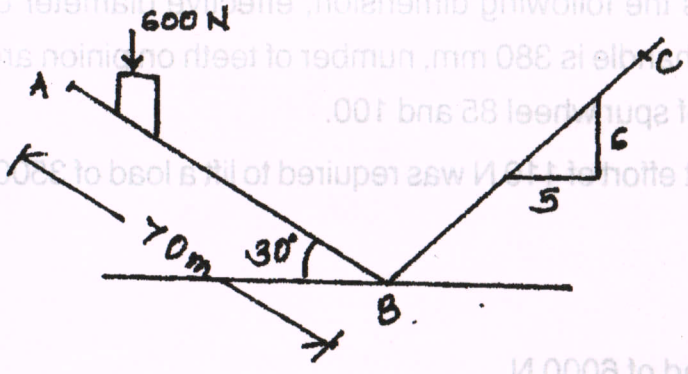

Fig. Q. No – 7 (a)

b) A block weighing 180 N is on an incline, whose slope is 8 vertical to 12 horizontal. Its initial velocity down the incline is 2.4 m/s. What will be its velocity 5 seconds later ? Coefficient of friction at all the contact surface as 0.3. Use impulse momentum method. **5**

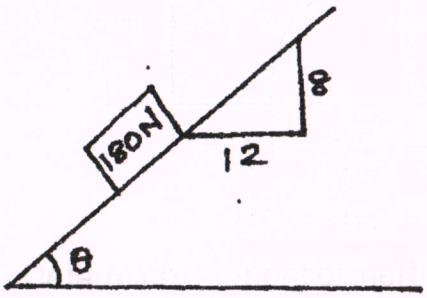

Fig. Q. No – 7 (b)

c) A motorist travelling at a speed of 80 kmph suddenly applies brakes and halts after skiddings 60 m. Determine :

1) The time required to stop the car.

2) The coefficient of friction between the tyres and road.

Use D'Alembert's principle. **5**

8. a) A double purchase crab has the following dimension, effective diameter of load drum 180 mm length of handle is 380 mm, number of teeth on pinion are 30 and 40, number of teeth of spur wheel 85 and 100.

When tested it was found that effort of 110 N was required to lift a load of 3500 N.

Determine :

1) Law of machine

2) Probable effort to lift a load of 6000 N

3) Efficiency in the above case. **8**

b) In a differential wheel and axle, the wheel has the diameter of 90 mm and the diameters of axles are 45 mm and 35 mm resp. An effort of 40 N is required to raise a load of 400 N. Calculate :

i) MA, VR and efficiency

ii) The effort lost in friction at the load of 300 N if efficiency at this load is 60%

iii) Maximum efficiency. **8**

c) In a simple lifting machine an effort of 160 N lifted a load of 250 N. In the same machine the effort required to lift a load of 375 N was 170 N. If the velocity ratio is 20, determine law of machine, maximum mechanical advantages, and maximum efficiency. **4**
