SEM 1 – 3 (RC 07-08)

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

Duration : 3 Hours Total Marks : 100

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

MODULE – I

1. a) Explain the scope of the following fields in civil engineering :
   i) Transportation Engineering
   ii) Geo-technical Engineering. **(5+5)**
   b) Write short notes on :
   i) Use of Aluminium as a building material
   ii) Components of superstructure of a building. **(5+5)**
2. a) Give general classification of bridges. With neat sketch, explain any one type of bridge. **10**
   b) Differentiate between load bearing structure and framed structure. **5**
   c) Briefly explain use of "FRP" in the construction. **5**

MODULE – II

3. a) Determine the resultant and also position of resultant for the force system acting as shown with respect to support B. **12**

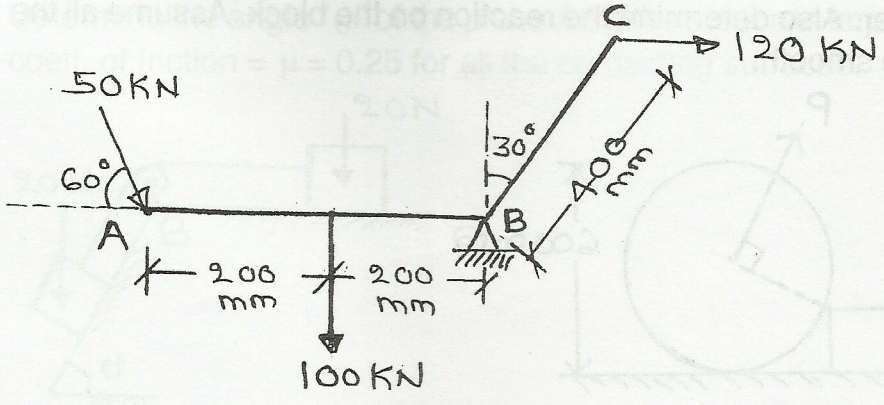
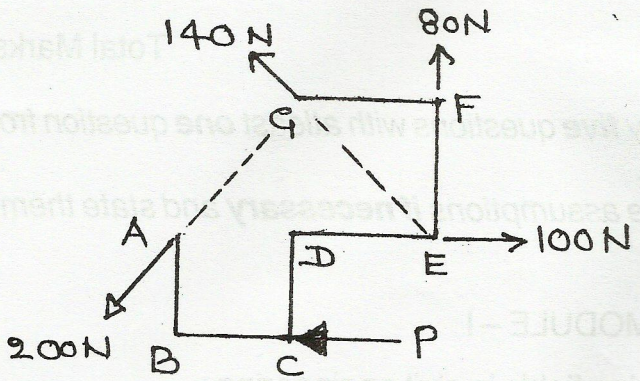


Fig. Q. No. 3 (a)

P.T.O.

b) Determine the magnitude of the force 'P' applied at 'C' to make the resultant of all the given forces inclusive of "P" to pass through the point A. **8**



AB = BC = CD = 90 mm

DE = EF = FG = 120 mm

Fig. Q. No. 3 (b)

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

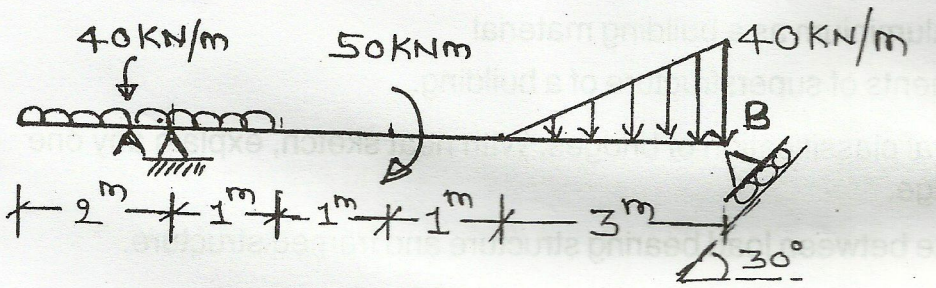


Fig. Q. No. 4 (a)

b) A uniform wheel of 600 mm diameter and weighing 5 kN rests against a rigid rectangular block of 150 mm height as shown. Determine the least value of force "P" applied through the centre of wheel which will just over turn the wheel at corner. Also determine the reaction on the block. Assume all the surfaces to be smooth. **10**

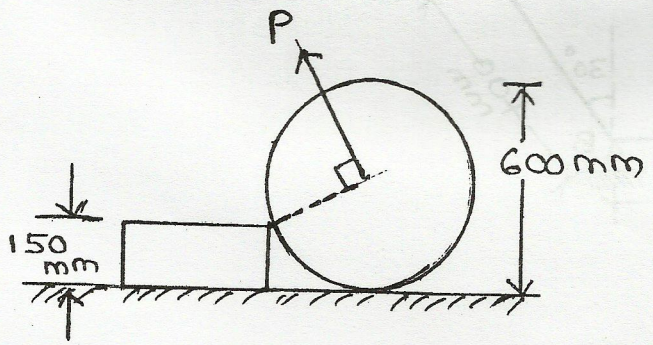


Fig. Q. No. 4 (b)

MODULE – III

5. a) Determine the position of centroid of the plane figure with respect to axes shown : 6

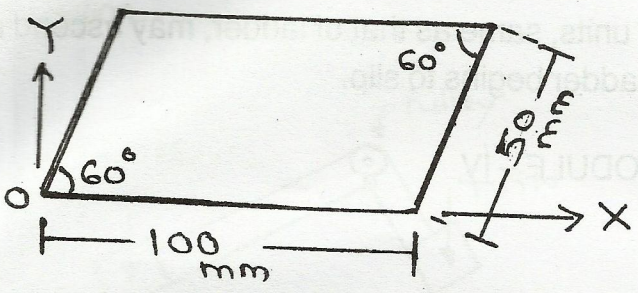


Fig. Q. No. 5 (a)

b) Determine the moment of inertia of the shaded area about both the centroidal axes. 14

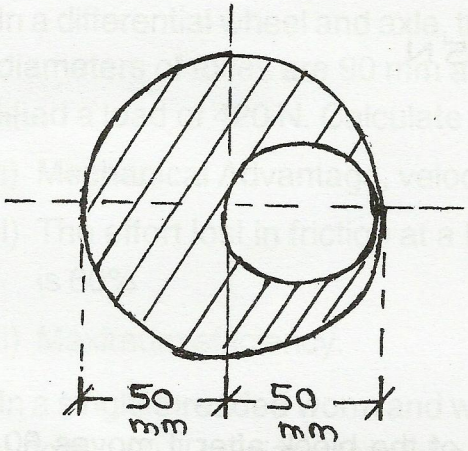


Fig. Q. No. 5 (b)

6. a) Determine the angle "θ" of the plane AB if the motion is impending. Assume coeff. of friction = μ = 0.25 for all the contacting surfaces. 8

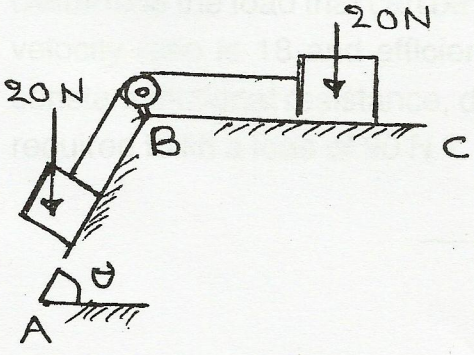


Fig. Q. No. 6 (a)

b) A uniform ladder of length "L" and weighing "W" units rests against a wall at an angle of 45° with the horizontal floor.

Coeff. of friction between ladder and floor = 0.6 coeff. of friction between wall and ladder = 0.4.

Show that a man weighing "W" units, same as that of ladder, may ascend a distance of 0.855 L before the ladder begins to slip. **12**

MODULE – IV

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

a) For the connected system shown, find acceleration of the system and tension in the string. Assume coeff. of friction = $\mu = 0.30$ for all the contacting surfaces. Use D. Alembert's principle. **10**

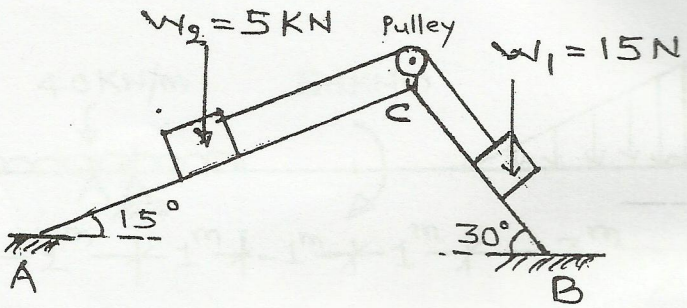


Fig. Q. No. 7 (a)

b) For the system shown, find the velocity of the block after it moves 60 m starting from rest. If the external force is then removed, how much further will the block move. Assume coeff. of friction = $\mu = 0.20$. Use "WORK ENERGY" principle. **10**

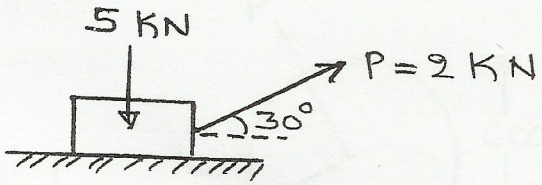


Fig. Q. No. 7 (b)

c) Find the time required for the system shown to attain a velocity of 20 m/sec starting from rest. Also determine the tension in the string. Assume the coeff. of friction = $\mu = 0.20$ for all the contacting surfaces. Use "Impulse Momentum" equation. **10**

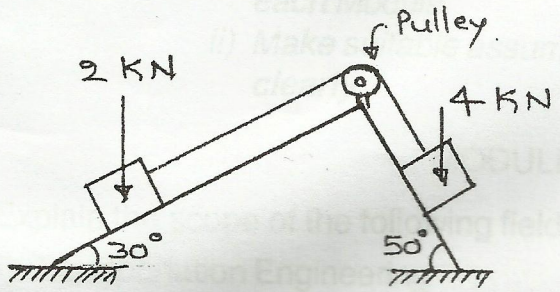


Fig. Q. No. 7 (c)

8. a) In a differential wheel and axle, the wheel has a diameter of 180 mm AND the diameters of axles are 90 mm and 70 mm respectively. An effort of 38 N lifted a load of 420 N. Calculate the following :

   i) Mechanical Advantage, velocity ratio and efficiency

   ii) The effort lost in friction at a load of 600 N if the efficiency at this load is 60%

   iii) Maximum efficiency. **6**

   b) In a single threaded worm and work wheel the numbers of teeth on the worm wheel is 60. The diameter of the effort wheel is 250 mm and that of load drum is 125 mm. The effort required to lift a load of 600 N by this machine is 20 N. Find the efficiency of the machine. **6**

   c) Determine the load that can be lifted by a machine by an effort of 12 N, if the velocity ratio is 18 and efficiency is 60% at this load. If the machine has constant frictional resistance, determine law of machine. What is the effort required to lift a load of 90 N ? **8**
