SEM 1 – 3 (RC 07-08)

F.E. (Semester-I) (Revised 2007-08) Examination, Nov./Dec. 2010
BASIC CIVIL ENGINEERING AND ENGINEERING MECHANICS

Duration : 3 hours | Total Marks : 100

Instructions : *1) Attempt **any five** questions with atleast **one** question from **each** Module.*
*2) **Figures** to right indicate **full** marks.*
*3) Make suitable **assumptions**, if necessary.*

MODULE – I

1. a) What is the importance of geotechnical field in Civil Engineering ? **4**

   b) Differentiate between load bearing and framed structure. What is raft foundation ? When it is generally adopted ? **6**

   c) Write short notes on : **(5+5)**

      i) Types of roads

      ii) Curing of concrete.

2. a) What is Self Compacting Concrete ?What is the advantage of it ? **6**

   b) Describe with neat sketch the following : **8**

      i) Suspension bridge

      ii) Components of road.

   c) Describe briefly how concrete is manufactured on site. **6**

MODULE – II

3. a) State Varignon's theorem. **1**

P.T.O.

b) What will be the effect produced by the two forces shown in Fig. on the object. Explain. 2

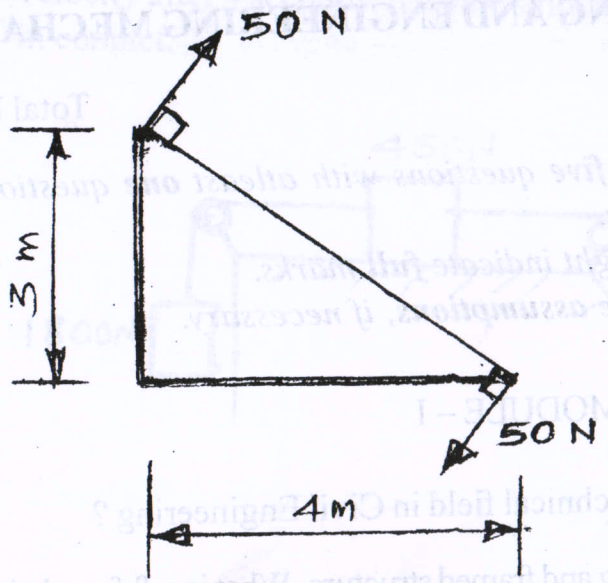

Fig. Q.3 (b)

c) Forces 15 KN, 25 KN, 20 KN and 3 KN respectively act at one of the angular point of a regular pentagon towards the other four points taken in order. Find their resultant completely. Refer Fig. 7

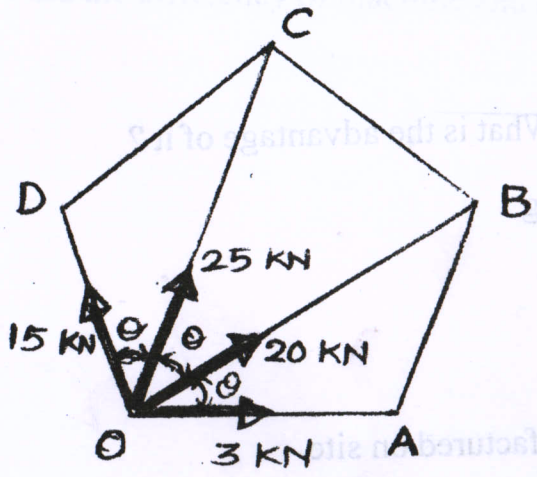

Fig. Q.3 (c)

d) Three cylinders are piled up in a rectangular channel as shown in Fig. Determine the reactions at all the contact points. The weights and radii of the cylinders are as follows : **10**

$W_A = 150$ N

$W_B = 400$ N

$W_C = 200$ N

$r_A = 4$ cm

$r_B = 6$ cm

$r_C = 5$ cm

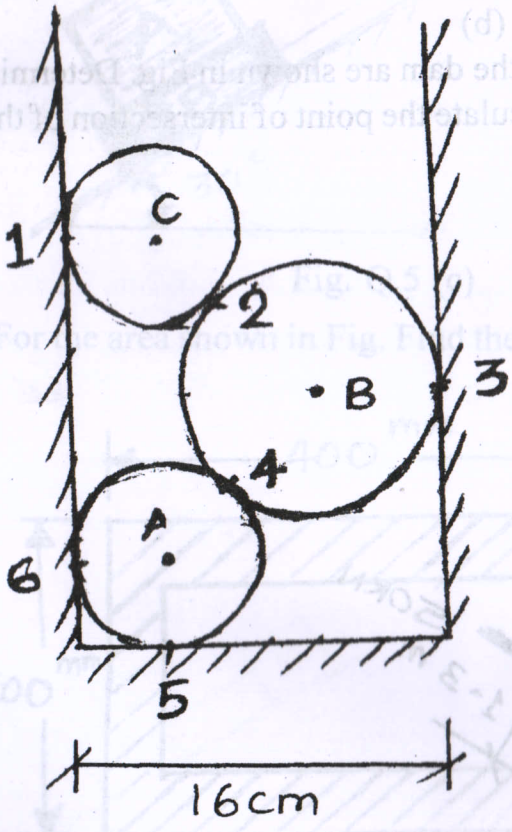

Fig. Q.3 (d)

4. a) State and prove LAMI's theorem. 3

b) Determine the support reactions for the beam AB loaded as shown in Fig. 10

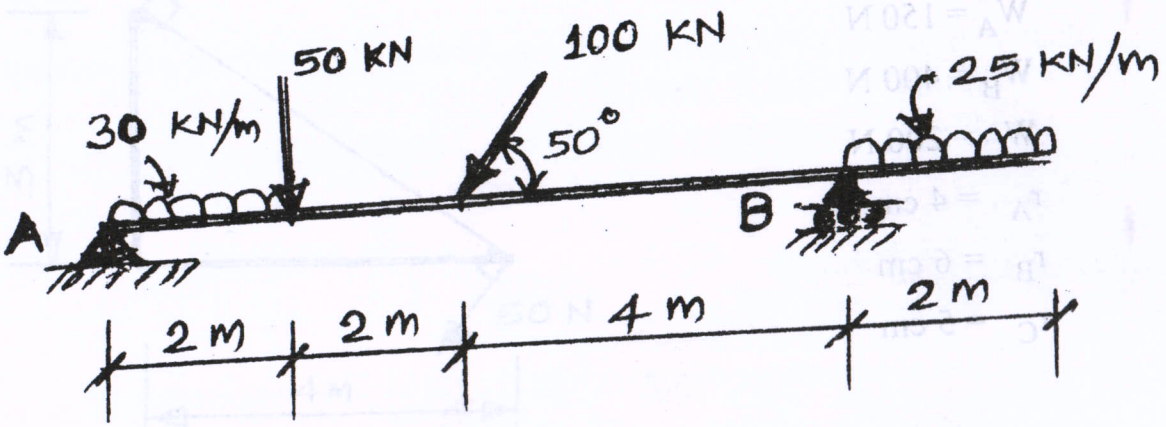

Fig. Q.4 (b)

c) The forces acting on the cross-section of the dam are shown in Fig. Determine the resultant force acting on the dam. Calculate the point of intersection of the resultant with the base. 7

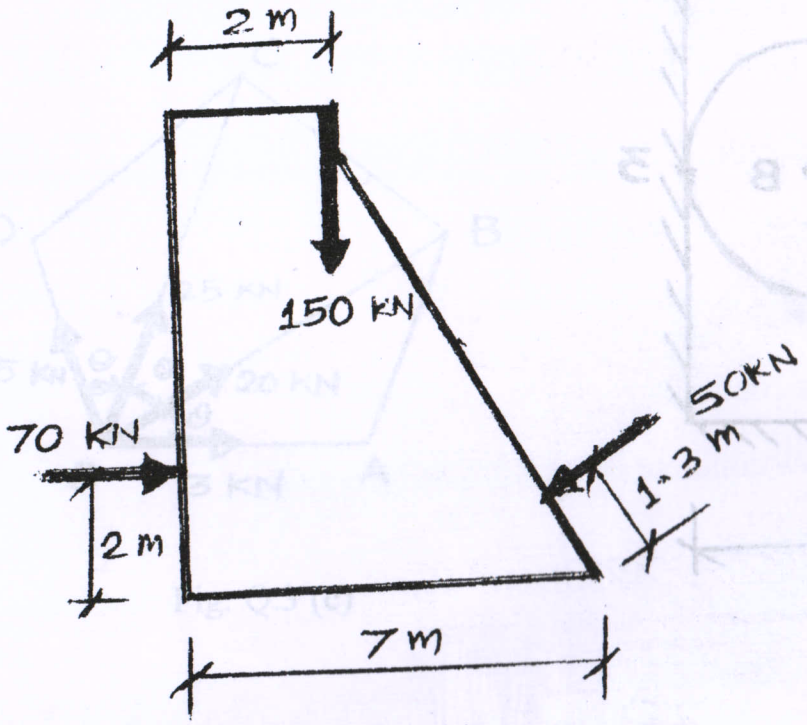

Fig. Q.4 (c)

MODULE – III

5. a) Define :

i) Angle of friction and ii) Angle of Repose. 2

b) By first principles, obtain an expression for the location of centroid for a semi-circular area of radius 'R'. 6

c) Block A has a mass of 30 Kg and Block B has a mass of 20 Kg. Knowing that the coefficient of static friction is 0.20 between the two blocks and 0 (zero) between the block B and the slope, find the magnitude of the frictional force between the two masses. What is the force in the string tying the blocks ? Take $g = 9.81$ m/sec^2. Block A is resting on block B. 8

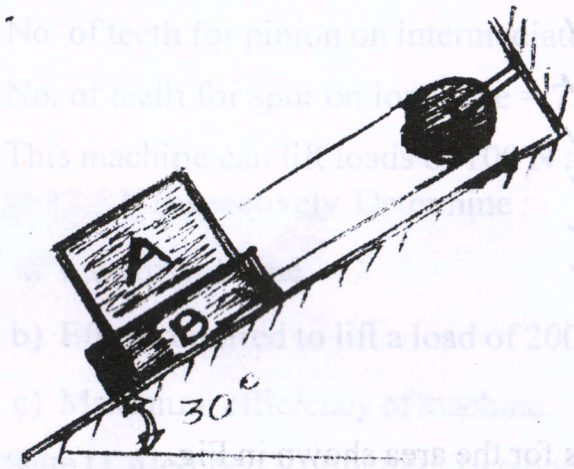

Fig. Q.5 (c)

d) For the area shown in Fig. Find the M-I about the axis AB. 4

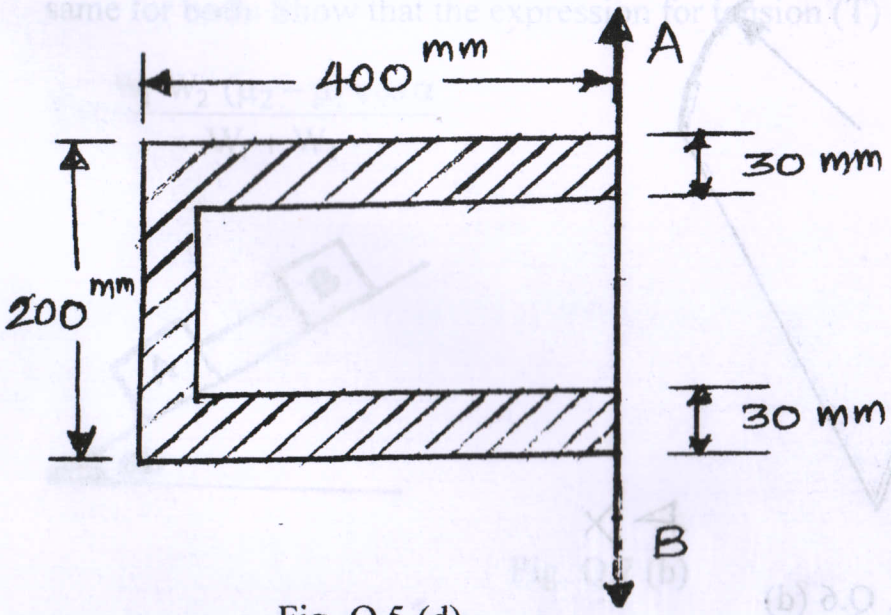

Fig. Q.5 (d)

6. a) Differentiate between centroid and centre of gravity. 2

b) For any two kind of surfaces in contact, how do we determine the angle of friction. 2

c) A heavy block weighing 3000 N is raised using a wedge as shown in Fig. What horizontal force P will be necessary to raise the block if μ for all contact surfaces is 0.25. Neglect the weight of the wedge. 8

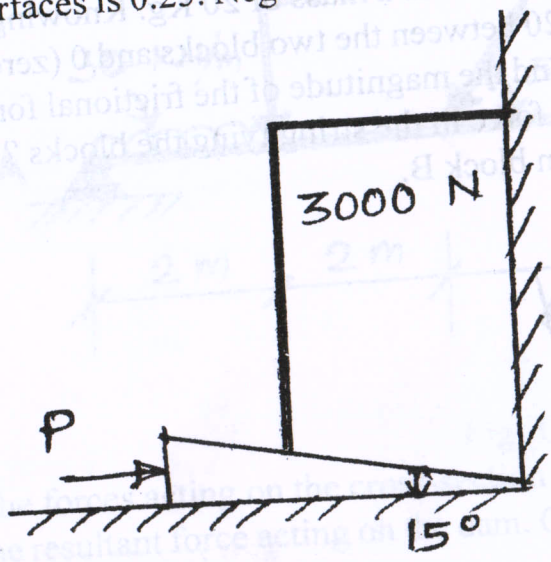

Fig. Q.6 (c)

d) Find M.I about both Centroidal Axes for the area shown in Fig. 8

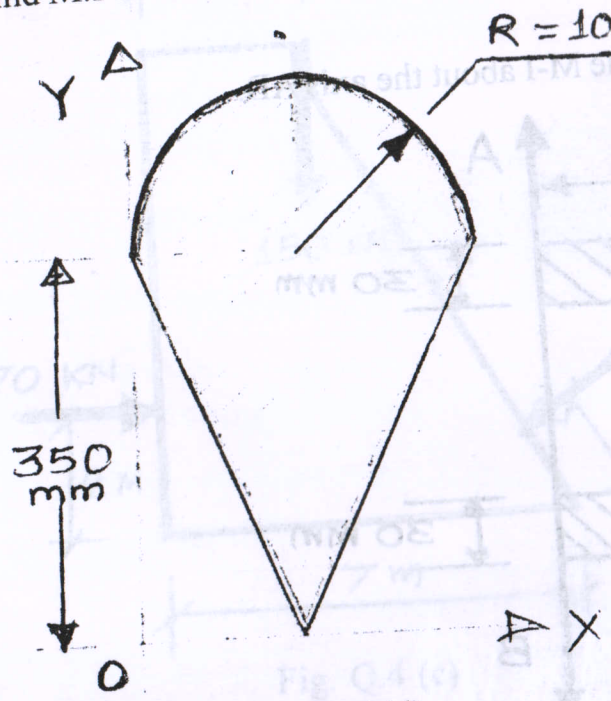

Fig. Q.6 (d)

MODULE – IV

7. a) Draw a neat sketch of double purchase winch crab and write the expression for velocity ratio. The following data refers to a double purchase crab : **12**

Length of lever = 400 mm

Dia of drum = 128 mm

No. of teeth for the pinion on effort axle = 15

No. of teeth for spur wheel on intermediate axle = 80

No. of teeth for pinion on intermediate axle = 20

No. of teeth for spur on load axle = 75

This machine can lift loads of 100 N and 150 N by applying efforts of 1.75 N and 2.5 N respectively. Determine :

a) Law of machine

b) Effort required to lift a load of 200 N and efficiency at this load

c) Maximum efficiency of machine.

b) State D'Alembert's principle. Two bodies A and B are joined by an inextensible string and the composite system moved down the inclined rough surface with coefficient of friction as μ_1 and μ_2 for A and B respectively. Acceleration is same for both. Show that the expression for tension (T) is given as : **8**

$$T = \frac{W_1 W_2 (\mu_2 - \mu_1 \cos \alpha}{W_1 + W_2}$$

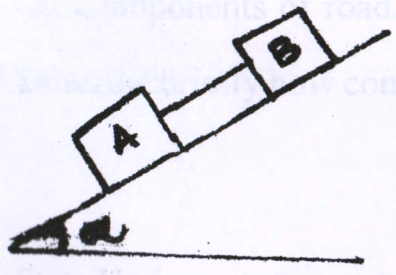

Fig. Q.7 (b)

8. a) State and explain impulse momentum equation.

The system shown below has a rightward velocity of 3 m/sec. Determine the velocity after 4 seconds. Assume smooth pulleys. Take $\mu = 0.25$ for all surfaces in contact. **10**

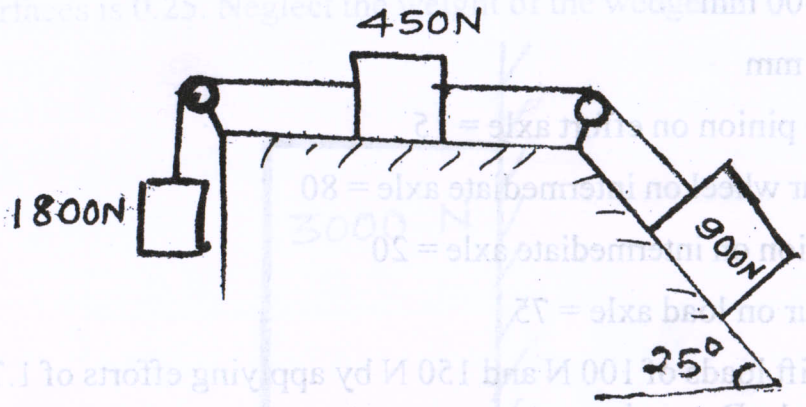

Fig. Q.8 (a)

b) Explain what do you understand by self locking machine. **2**

c) Explain Law of machine also derive an expression for maximum efficiency of machine. In case of a lifting machine, efforts required to lift loads of 50 N and 80 N were 12 N and 18 N respectively. If velocity ratio for the machine was 6. Find the efficiency of machine and effort lost in friction at 50 N. **8**
