F.E. (Semester – I) (RC 2007–08)
Examination, November/December 2017
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** and state them **clearly**.*

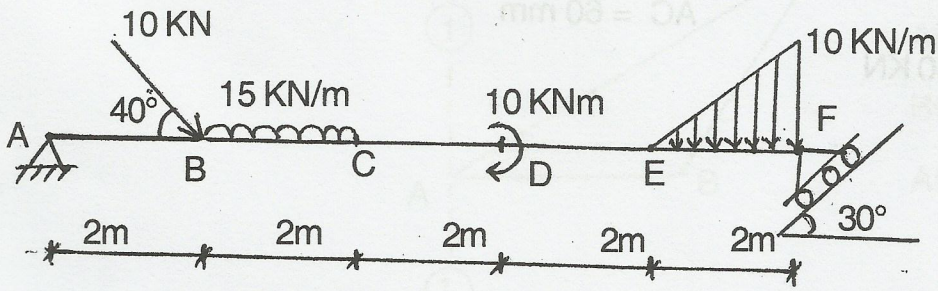
MODULE – I

1. a) Write short note on (**any two**) : **(3×2=6)**
   i) Grade of concrete and curing.
   ii) Types of steel sections.
   iii) Water cement ratio and workability.
   b) Explain the various components of roads and also state the functions of roads. **10**
   c) What is combined footing and explain where such type of footing is generally adopted. **4**

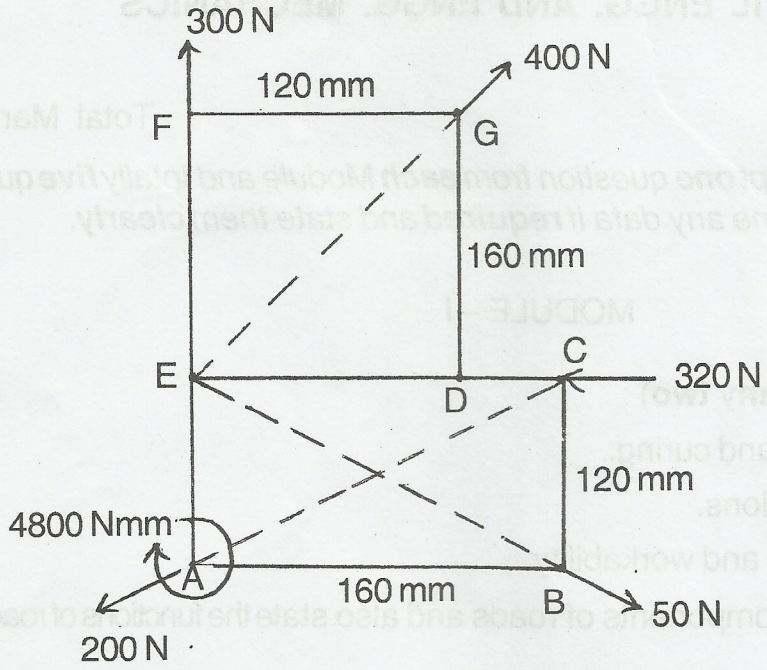
2. a) Give general classification of bridges. Describe any two types of bridges with neat sketches. **10**
   b) Write notes on : **(5×2=10)**
   i) Load bearing and framed structure.
   ii) Environmental Engineering and surveying.

MODULE – II

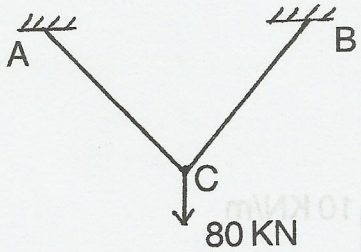
3. a) Determine support reactions of the beam. **8**



b) Find the resultant and locate the same on AB with due consideration to the applied moment. **12**



4. a) Determining the tension in the string AC and BC when a load of 80 KN is suspended at C. **8**

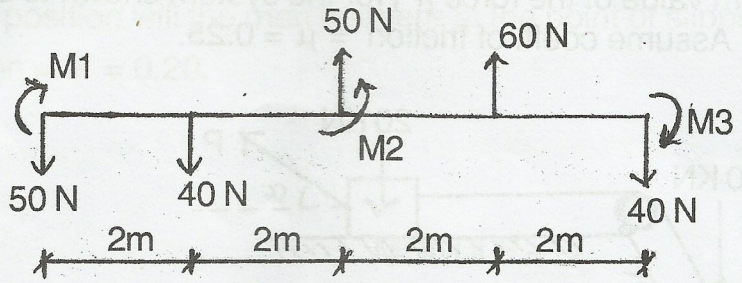


AB = 100 mm

BC = 80 mm

AC = 60 mm

b) Replace the given force by a single force and a couple. **12**



M1 = 90 Nm

M2 = 75 Nm

M3 = 100 Nm

MODULE – III

5. a) Determine the position of centroid for the plane figure with respect to axes shown. All dimensions are in mms. **8**

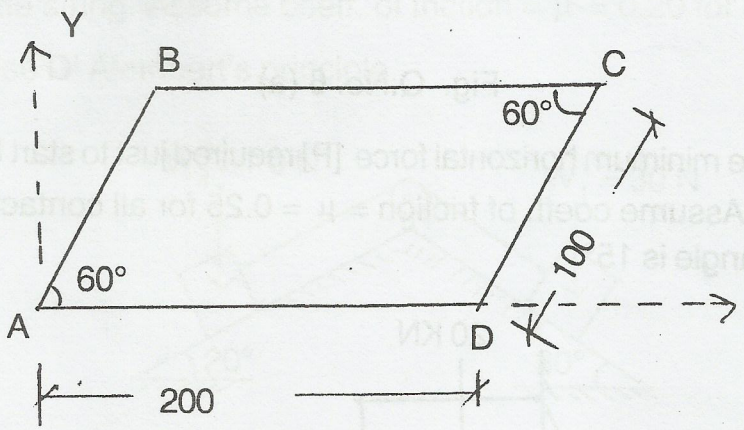
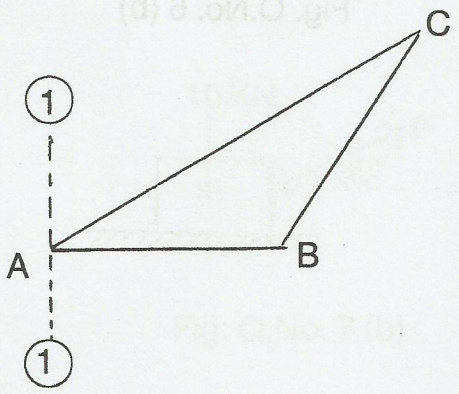


Fig. Q.No. 5 (a)

b) Determine the moment of inertia about the Section ① ① passing through point "A" for the plane Lamina shown. All the dimensions are in mms. **12**



AB = 40 mm

BC = 50 mm

AC = 80 mm

Fig. Q.No. 5 (b)

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

a) What is the minimum value of the force [P] for the system shown to cause motion to impend ? Assume coeff. of friction = $\mu = 0.25$. **10**

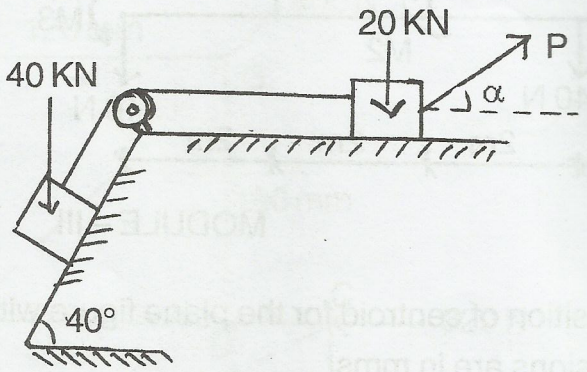


Fig. Q.No. 6 (a)

b) Determine the minimum horizontal force [P] required just to start the movement of the body. Assume coeff. of friction = $\mu = 0.25$ for all contacting surfaces. The wedge angle is 15°. **10**

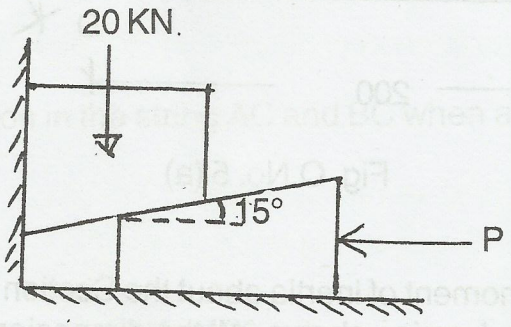


Fig. Q.No. 6 (b)

c) A uniform ladder of length 5 m and weighing 250 N is placed against a wall at an angle of 60° with the floor. A man weighing 1000 N climbs the ladder. At what position will the man be there at the point of slipping. Assume coeff. of friction = μ = 0.20. **10**

MODULE – IV

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

a) For the connected system shown, find the acceleration of the system and tension in the string. Assume coeff. of friction = μ = 0.20 for all contacting surfaces. Use D' Alembert's principle. **10**

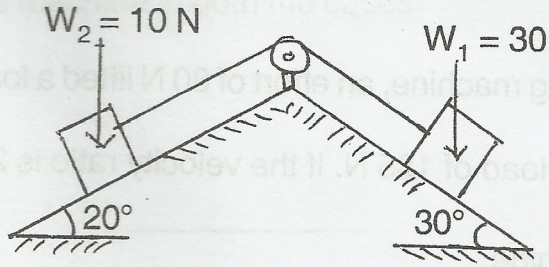


Fig. Q. No. 7 (a)

b) For the system shown, find the velocity of the block after it moves 50m starting from rest. If the external force is then removed, how much further will the block move. Assume coeff. of friction = μ = 0.20. Use "Work Energy" principle. **10**

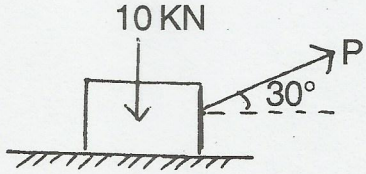


Fig. Q.No. 7 (b)

c) Find the time required for the system shown to attain a velocity of 20 m/sec. starting from the rest. Also find out tension in the string. Assume coeff. of friction = μ = 0.20 for all contacting surfaces.

Use "Impulse Momentum" equation. **10**

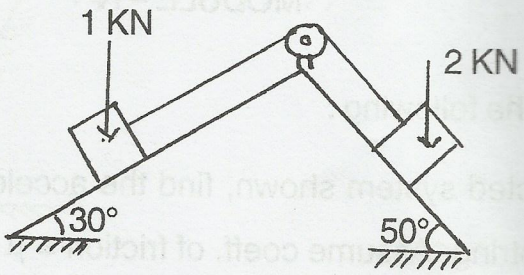


Fig. Q.No. 7 (c)

8. a) In a simple lifting machine, an effort of 80 N lifted a load of 125 N and an effort of 85 N lifted a load of 185 N. If the velocity ratio is 20, determine : **10**

i) Law of machine.

ii) Efficiency of the machine at 125 N load.

iii) Effort lost in friction when the load of 125 N is lifted.

iv) Maximum Mechanical Advantage.

v) Maximum efficiency.

b) A single purchase crab has the following details

No. of teeth on pinion = 12

No. of teeth on spur wheel = 96

Length of lever = 700 mm

Diameter of load axle = 200 mm

An effort of 60 N lifts a load of 1800 N and an effort of 120 N lifts a load of 3960 N. Determine : **10**

i) Law of machine

ii) Efficiency of the machine in both the cases.