F.E. (Semester – I) (RC – 2007-08)Examination, May/June 2018
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) Explain the importance of the following in civil engineering : **(3×3=9)**
   i) Hydraulics ii) Environmental Engineering
   iii) Transportation Engineering.

   b) Write short notes on **(any two)** : **(3×2=6)**
   i) RMC and SCC
   ii) Water cement ratio and workability
   iii) Use of FRP as building material.

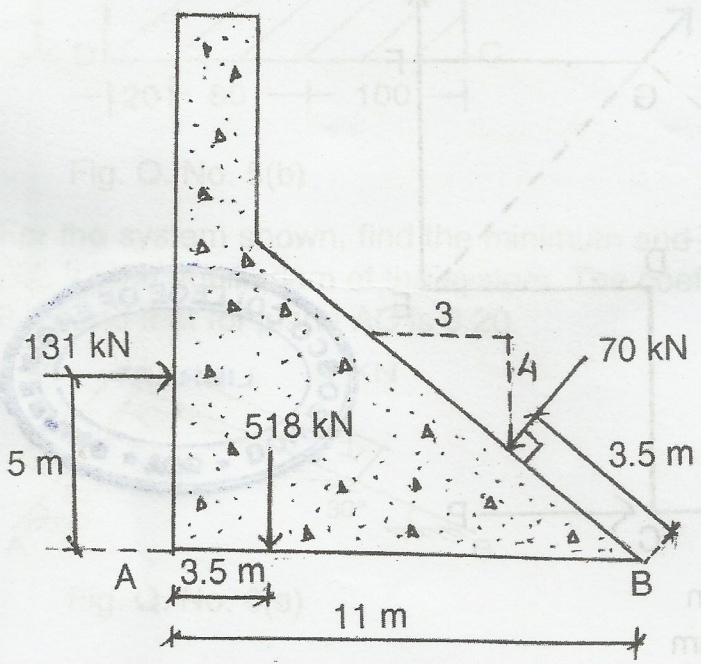
   c) What is the function of superstructure of a building ? Explain with a neat sketch. **5**

2. a) Define reinforced cement concrete and give account of its ingredients. Also explain why there is a need for compaction and curing of concrete. **10**

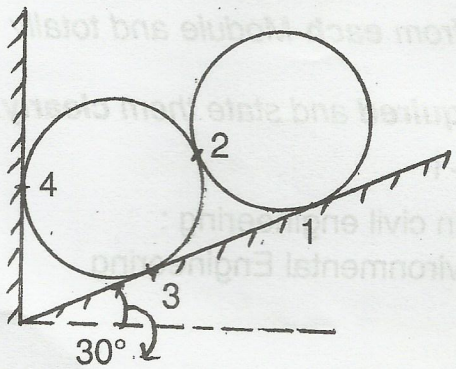
   b) Give general classification of bridges. Describe any two types of bridges with neat sketches. **10**

MODULE – II

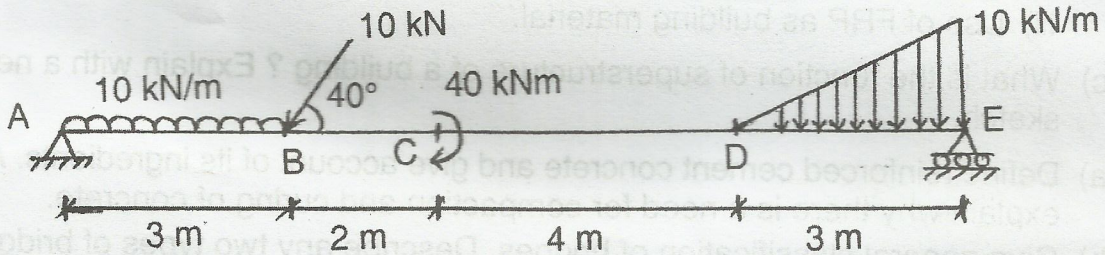
3. a) Three forces are acting on a dam section as shown in the fig. Determine the resultant force and locate its distance from point A of the base AB. **10**



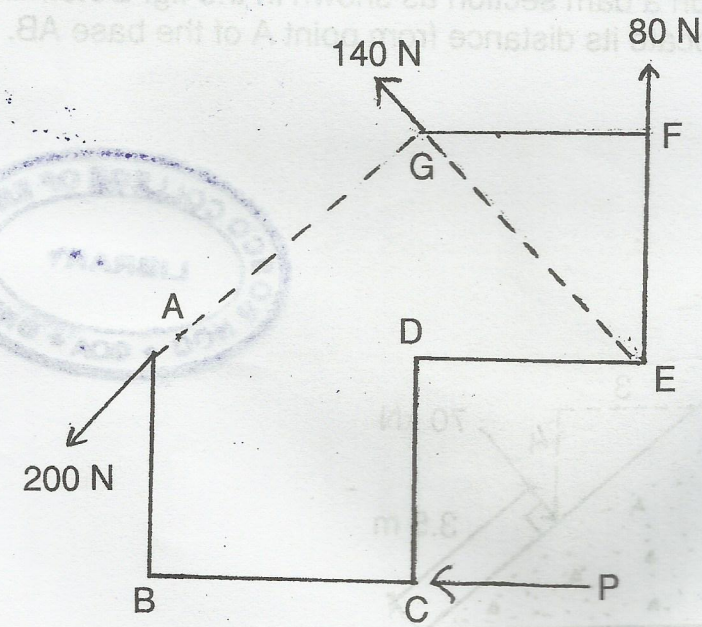
b) Two identical rollers each of weight 100 N are supported by an inclined plane and a vertical wall. Find the reaction at all contact surfaces. Assume all surfaces to be smooth. **10**



4. a) Determine the value of reaction of the beam loaded as shown. **10**



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. **10**



AB = BC = CD = 90 mm

DE = EF = FG = 120 mm

MODULE – III

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

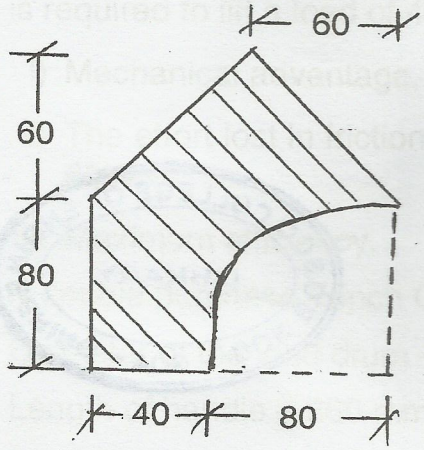


Fig. Q. No. 5(a)

b) Determine the moment of inertia about both the centroidal axes for the shaded area shown. All the dimensions are in mms. **12**

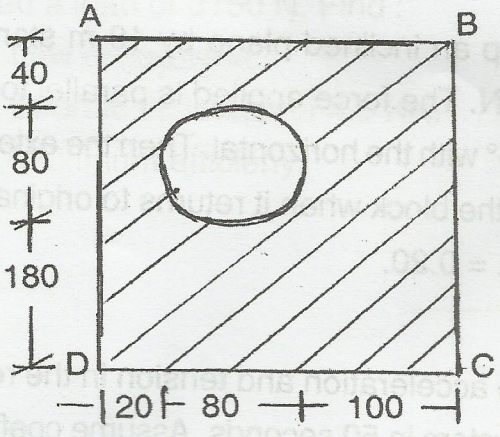


Fig. Q. No. 5(b)

6. a) For the system shown, find the minimum and maximum value of the load (W) for the equilibrium of the system. The coeff. of friction for plane BC is 0.25 and that for plane AC is 0.20. **10**

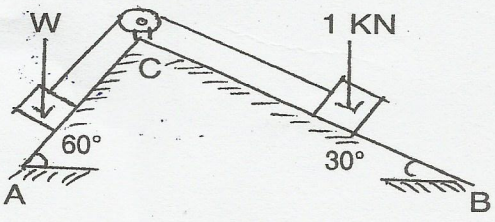


Fig. Q. No. 6(a)

b) A 15° wedge is used to tighten the concrete block weighing 40 KN as shown. Assuming angle of friction as 14° for all contacting surfaces, determine the magnitude of the force (P). **10**

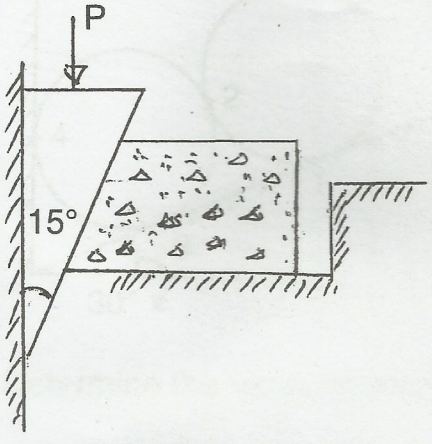
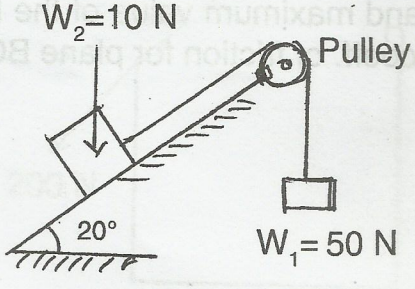


Fig. Q. No. 6 (b)

MODULE – IV

7. a) A block weighing 10 KN is pushed up an inclined plane by 10 m starting from rest, by applying a force of 12 KN. The force applied is parallel to the plane. The plane makes an angle of 35° with the horizontal. Then the external force is removed. Find the velocity of the block when it returns to original position. Assume coeff. of friction = μ = 0.20.
Use work energy principle. **10**

b) For the system shown, determine the acceleration and tension in the rope. What is the distance covered by the system in 50 seconds. Assume coeff. of friction = μ = 0.20. Use D'Alembert's principle. **10**



8. a) 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 respectively. An effort of 40 N is required to lift a load of 400 N. Calculate :

   i) Mechanical advantage, velocity ratio 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**

   b) A double purchase Winch Crab has the following details.

   Diameter of the load drum – 160 mm

   Length of handle – 360 mm

   No. of teeth on pinions – 20 and 30

   No. of teeth on spur wheels – 75 and 90.

   It was found that an effort of 90N lifted a load of 1800N and an effort of 135 N lifted a load of 3150 N. Find :

   i) Law of machine.

   ii) Effort to lift a load of 4.5 KN.

   iii) Maximum efficieny. **12**