Total No. of printed pages = 4

BES-304/AM/3rd Sem/2016/N

APPLIED MECHANICS

Full Marks – 70

Pass Marks – 28

Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer any *five* questions.

1. (a) What do you mean by engineering mechanics ? Classify it. 2+3=5

   (b) Write about the effects and various characteristics of a force. 6

   (c) What do you mean by system of forces ? Define any two system of forces. 1+2=3

2. (a) What is a couple ? What is the arm of a couple and its moment ? 1+2=3

   (b) Enunciate any two principles of equilibrium. 3

   (c) Define coefficient of friction and limiting friction. 3

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(d) What is a frame ? Discuss its classification. 5

3. (a) Find the magnitude of the resultant force, if 30N, 40N, 50N and 60N forces are acting along the lines joining the centre of a square to its vertices. 5

(b) The forces 20N, 30N, 40N 50N and 60N are acting at one of the angular points of a regular hexagon, towards the other five angular points, taken in order. Find the magnitude and direction of the resultant force. 7

(c) A rod AB 2.5m long is supported at A and B. The rod is carrying a point load of 5kN at a distance of 1m from A. What are the reactions at A and B ? 2

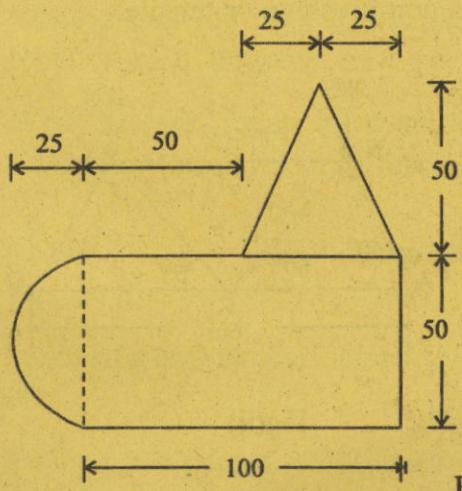
4. (a) A beam AB of length 5m supported at A and B carries two point loads W_1 and W_2 of 3 kN and 5 kN which are 1m apart. If the reaction at B is 2 kN more than that at A, find the distance between the support A and the load 3 kN. 7

(b) Find the force required to move a load of 300 N up a rough plane, the force being applied parallel to the plane. The inclination of the plane is such that when the same load is kept on a perfectly smooth plane inclined at the same

angle, a force of 60N applied at an inclination of 30° to the plane, keeps the same load in equilibrium.
Assume co-efficient of friction between the rough plane and the load to be equal to 0.3. 7

5. (a) A load of 500N is lying on an inclined plane, whose inclination with the horizontal is 30°. If the coefficient of friction between the load and the plane is 0.4, find the minimum and maximum horizontal force which will keep the load in equilibrium ? 7

(b) A uniform lamina shown in Fig (i) consists of a rectangle, a circle and a triangle. Determine the centre of gravity of the lamina. All dimensions are in mm. 7

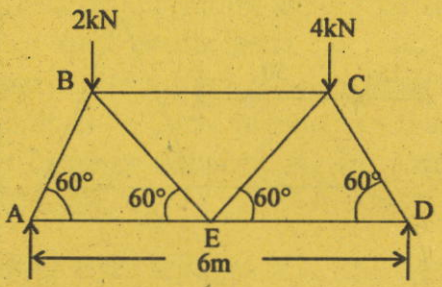


Fig(i)

6. (a) Find the moment of inertia of a T-section with flange as 150 mm × 50 mm and web as 150 mm × 50 mm about X-X and Y-Y axes through the centre of gravity of the section. 10

(b) Find the moment of inertia of a hollow rectangular section about its centre of gravity if the external dimensions are breadth 60 mm, depth 80 mm and internal dimensions are breadth 30 mm and depth 40 mm respectively. 4

7. Figure (ii) shows a Warren girder consisting of seven members each of 3m length freely supported at its end points. The girder is loaded at B and C as shown. Find the forces in all the members of the girder, indicating whether the force is compressive or tensile. 14



Fig(ii)