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BET-014

DIPLOMA IN CIVIL ENGINEERING (DCLE(G)) / DIPLOMA IN MECHANICAL ENGINEERING (DME) / DCLEVI / DMEVI / DELVI / DECVI / DCSVI / ACCLEVI / ACMEVI / ACELVI / ACECVI / ACCSVI

Term-End Examination

00042

December, 2016

BET-014 : APPLIED MECHANICS

Time : 2 hours *Maximum Marks : 70*

Note : *Question no. 1 is* ***compulsory****. Attempt any* ***four*** *from the remaining questions. Use of scientific calculator is permitted.*

1. Choose the correct answer from the four given alternatives. *7×2=14*

(a) Block A, weighing 1000 N rests over Block B which weighs 2000 N as shown in Figure 1. Block A is tied to a wall with a horizontal string and Block B is to be moved. The coefficient of friction between A and B is 1/4 and between B and the floor is 1/3.

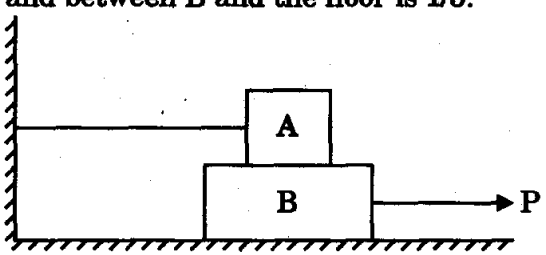

Figure 1

When P is horizontal, the value of reactions R_1 and R_2 for Blocks A and B respectively are

(i) 3000 N and 1000 N

(ii) 1000 N and 3000 N

(iii) 1000 N and 2000 N

(iv) 2000 N and 1000 N

(b) The equation of motion of a particle is

$$s = -5 - 6t^2 + 2t^3,$$

where s is in metres and t is in seconds.

The displacement and the acceleration when the velocity is zero, will be

(i) 6 m, 6 m/s^2

(ii) 13 m, 12 m/s^2

(iii) 12 m, 6 m/s^2

(iv) 12 m, 12 m/s^2

(c) Force can be characterized by

(i) point of application

(ii) magnitude and direction

(iii) direction

(iv) point of application, magnitude and direction

(d) The resultant of two forces can be defined as a force that

(i) keeps the system in equilibrium

(ii) has the greatest magnitude in the system

(iii) has the same effect as the two forces

(iv) has the same effect as one force

(e) The resultant of two forces is equal to each of the forces. The angle between them is

(i) 0°

(ii) 90°

(iii) 180°

(iv) 120°

(f) A body of weight W is placed on an inclined plane. The angle made by the inclined plane with the horizontal, when the body is on the point of moving down is called

(i) Angle of inclination

(ii) Angle of repose

(iii) Angle of friction

(iv) Angle of limiting friction

(g) From a circular area of radius R, a smaller circle of radius r is removed as shown in Figure 2 such that R = 2r.

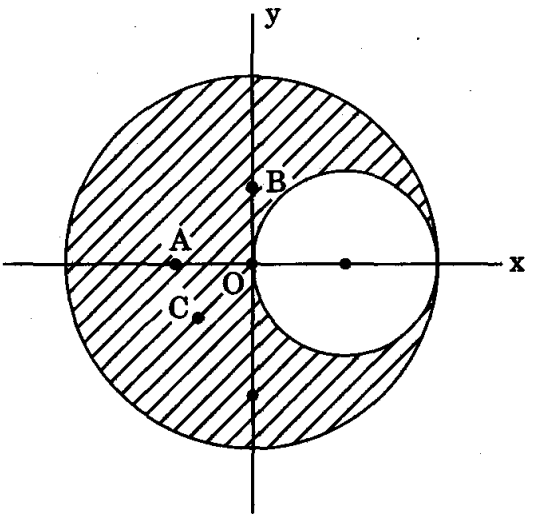

Figure 2

The coordinates of the centroid of the figure is

(i) O (0, 0)

(ii) $A\left(-\frac{r}{3}, 0\right)$

(iii) $B\left(0, \frac{r}{3}\right)$

(iv) $C\left(-\frac{r}{3}, \frac{r}{3}\right)$

2. An electric-light fixture of weight Q = 178 N is supported as shown in Figure 3. Determine the tensile forces S_1 and S_2 in the wires BA and BC, if their angles of inclination are as shown. *14*

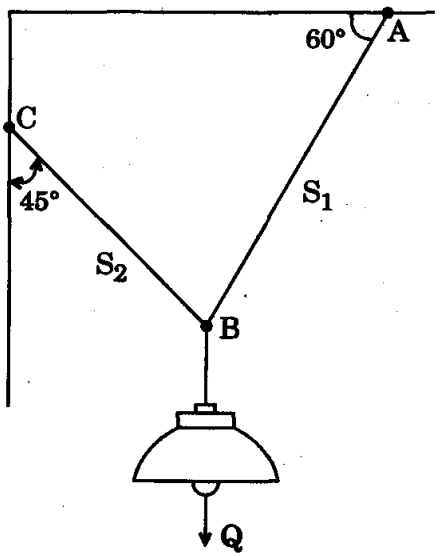

Figure 3

3. Locate the centroid of the shaded three-quarters of the area of a square of dimension 'a' as shown in Figure 4. *14*

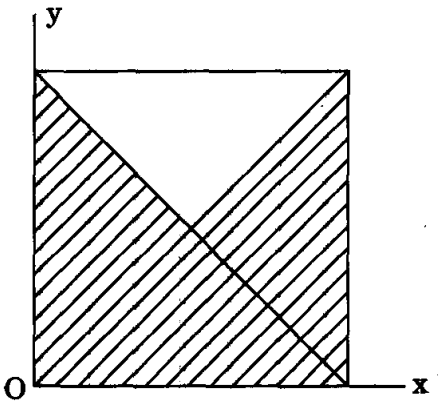

Figure 4

4. A particle is projected at such an angle that the horizontal range is three times the maximum height. Find the angle of projection. *14*

5. Find the forces in members of the truss as shown in Figure 5. *14*

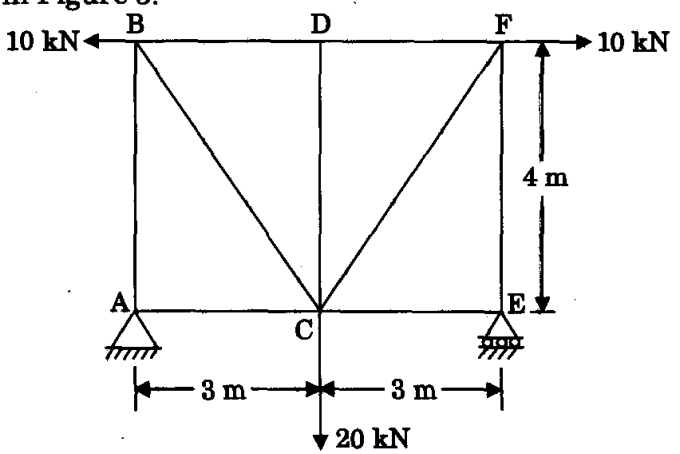

Figure 5

6. A block of weight W_1 = 1290 N rests on a horizontal surface and supports another block of weight W_2 = 570 N on top of it as shown in Figure 6. The block of weight W_2 is attached to a vertical wall by an inclined string AB. Find the force 'P' applied to the lower block that is necessary to cause the slipping to impend. Coefficient of friction between blocks (1) and (2) = 0·25, coefficient of friction between block (1) and the horizontal surface = 0·40. *14*

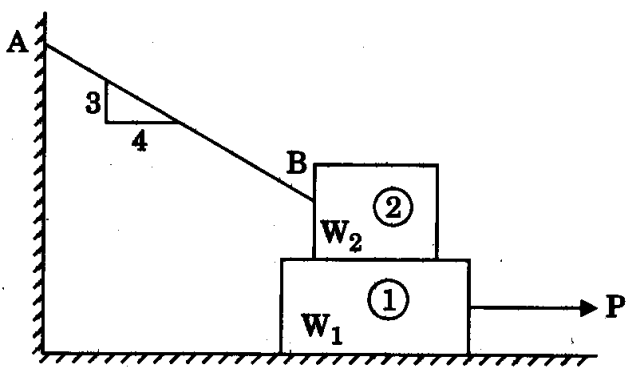

Figure 6

7. If five forces act on a particle as shown in Figure 7, determine the resultant force. *14*

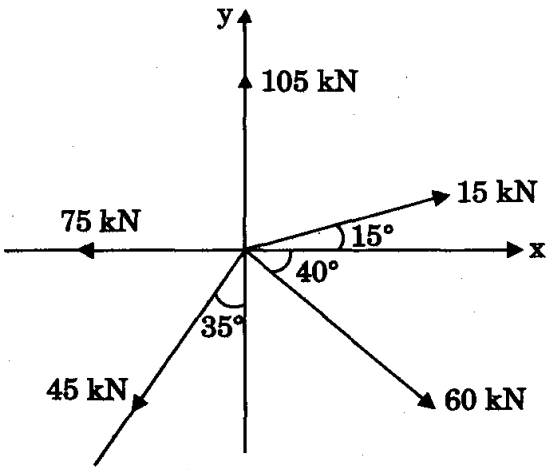

Figure 7

8. A body of 100 kg has its velocity changed from 6 m/s to 10 m/s in the same direction in 40 seconds. Find

   (a) the change in momentum, and

   (b) the force responsible for this change. *14*