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

December, 2012 03549

BET-014 : APPLIED MECHANICS

Time : 2 hours *Maximum Marks : 70*

Note : *Question **No. 1** is **compulsory**. Attempt **any four** from remaining questions. Assume suitable data wherever necessary.*

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1. Choose the correct answer from the given alternatives : **7x2=14**

(a) Which of the following statement is correct ?

(i) A force is an agent which produces or tends to produce motion.

(ii) A force is an agent which destroys or tends to destroy motion.

(iii) A force may balance a given number of forces already acting on a body.

(iv) Both (i) and (ii)

(v) All of the above

(b) If a body is in equilibrium, we may conclude that :

(i) no force is acting on the body

(ii) the resultant of all forces acting on it is zero.

(iii) the moments of all forces about any point is zero.

(iv) both (ii) and (iii)

(c) A truss of triangular shape is :

(i) perfect (ii) imperfect

(iii) deficient (iv) redunant

(d) The linear velocity of a rotating body is given by the relation :

(i) $v = r\omega$ (ii) $v = \frac{r}{\omega}$

(iii) $v = \frac{\omega}{r}$

Where r = radius of circular path and

ω = angular velocity of body in radians/sec

(e) The kinetic energy of a body mass (m) and velocity (v) is equal to :

(i) mv (ii) $\frac{mv}{2}$

(iii) $\frac{m^2v}{2}$ (iv) $\frac{mv^2}{2}$

(f) The velocity ratio of differential wheel and axle with D as the diameter of effort wheel and d_1 and d_2 as the diameters of larger and smaller axles respectively is :

(i) $\frac{2D}{(d_1 + d_2)}$ (ii) $\frac{2D}{(d_1 - d_2)}$

(iii) $\frac{D}{(d_1 + d_2)}$ (iv) $\frac{D}{(d_1 - d_2)}$

(g) A circular hole of radius (r) is cut out from a circular disc of radius (2r) is such a way that the diameter of the hole is the radius of the disc. The centre of gravity of the section lies at :

(i) centre of the disc
(ii) centre of the hole
(iii) somewhere in the disc
(iv) somewhere in hole

2. The side of a square ABCD, shown in Figure 1, is 1.60m long. Four forces equal to 6, 5, 4 and 8 N act along the line CB, BA, DA and DB, respectively. Find the moment of these forces about O, the point of intersection of the diagonals of the square. **14**

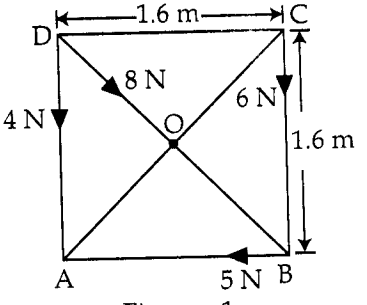

Figure - 1

3. A board ABCD is held in position, as shown in Figure 2, by a cable BE and hinge at A. If the weight of the board is 5 kN, determine the reactions at hinge A and the tension T in the cable. **14**

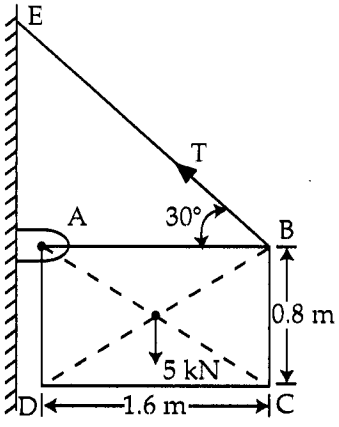

Figure - 2

4. The truss ABC, shown in Figure 3 below, has a span of 5 meters. It is carrying a load of 10 kN at its apex. Find the forces in members AB, AC and BC. **14**

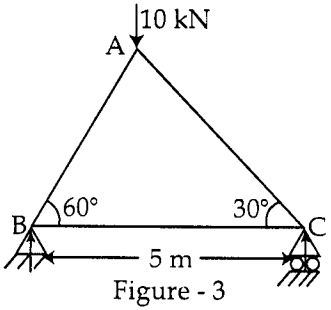

Figure - 3

5. A square plate of uniform thickness and density is bent along M_1, M_2 till corner C coincides with centre C', as shown in Figure 4. Determine the centre of gravity of the area thus formed. 14

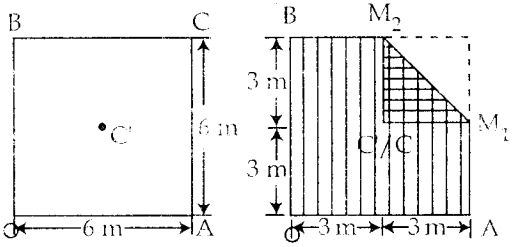

Figure - 4

6. Body A is thrown with a velocity of 10 m/s at an angle 60° to the horizontal. If another body B is thrown at any angle of 45° to the horizontal, find its velocity if it has the same (a) horizontal range (b) maximum hight (c) time of flight, as the body A. 14

7. Find the moment of inertia about the centroidal axis (X – X) and (Y – Y) of an inverted L-section of size 15 cm × 10 cm × 2.5 cm, as shown in Figure 5. 14

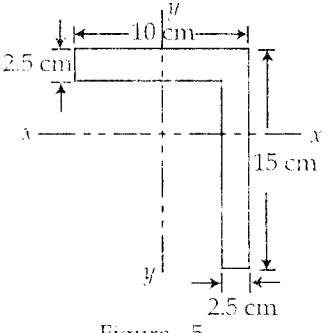

Figure - 5

8. An engine of mass 50 tonnes pulls a train of mass 250 tonnes up a gradient of 1 in 125 with a uniform speed of 36 km/hr. Find the Power transmitted by the engine, if the tractive resistance is 60 newtons per tonne. **14**

Also find the power transmitted by the engine, if the acceleration of the engine is 0.2 m/s^2. Take $g = 9.8\ m/s^2$.