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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

June, 2013

00044

BET-014 : APPLIED MECHANICS

Time : 2 hours *Maximum Marks : 70*

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

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

(a) The resultant of two forces P and Q acting at an angle θ is equal to :

(i) $\sqrt{P^2+Q^2+2\,PQ\sin\theta}$

(ii) $\sqrt{P^2+Q^2+2\,PQ\cos\theta}$

(iii) $\sqrt{P^2+Q^2-2\,PQ\sin\theta}$

(iv) $\sqrt{P^2+Q^2-2\,PQ\cos\theta}$

....

(b) The moment of a force about any point is geometrically equal to _____area of the triangle , whose base is the line representing the force and vertex is the point about which the moment is taken.

(i) half

(ii) same

(iii) twice

(iv) none of these

(c) 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 moment of all forces acting on it is zero

(iv) Both (ii) & (iii)

(d) The C.G. of an equilateral triangle with each side (a) is _____ from any of three sides.

(i) $\frac{a\sqrt{3}}{2}$ (ii) $\frac{a\sqrt{2}}{3}$

(iii) $\frac{a}{2\sqrt{3}}$ (iv) $\frac{a}{3\sqrt{2}}$

(e) The moment of inertia of a triangular section of base (b) and height (h) about an axis passing through its C.G. and parallel to base is given by relation :

(i) $\frac{bh^3}{12}$ (ii) $\frac{bh^3}{24}$

(iii) $\frac{bh^3}{36}$ (iv) $\frac{bh^3}{48}$

(f) The force of friction between two bodies in contact :

(i) depends upon their area of contact.

(ii) depends upon their relative velocity between them.

(iii) depends upon characteristics of surfaces of contact.

(iv) all of the above.

(g) The horizontal range of a projectile is :

(i) $\frac{u \sin 2\alpha}{g}$ (ii) $\frac{u^2 \sin 2\alpha}{g}$

(iii) $\frac{u \sin 2\alpha}{2g}$ (iv) $\frac{u^2 \sin 2\alpha}{2g}$

7. A particle is projected with a velocity of 5 m/s at an elevation of 60° to the horizontal. Find the velocity of another particle thrown at an elevation of 45° which have (a) equal horizontal range (b) equal maximum height (c) equal time of flight. **14**

2. (a) Find the magnitude of two forces, such that if they act at right angles, their resultant is $\sqrt{10}$ N, but if they act at 60° their resultant is $\sqrt{13}$ N. 6

(b) Find the magnitude and direction of the resultant, if forces 20 N, 30 N, 40 N, 50 N and 60 N are acting at a point in same plane at an angle of 0°, 30°, 60°, 90°, 120° respectively from horizontal. 8

3. (a) Explain Lammis theorem with the help of an example. 6

(b) A string ABCD attached to two fixed points A and D has two equal weights of 1000N attached to it at B and C. The weight rests with portions AB and CD inclined at an angles of 30° and 60° respectively to the vertical as shown in figure-1. Find the tensions in portions AB, BC and CD of the string, if inclinations of portion BC with vertical is 120°. 8

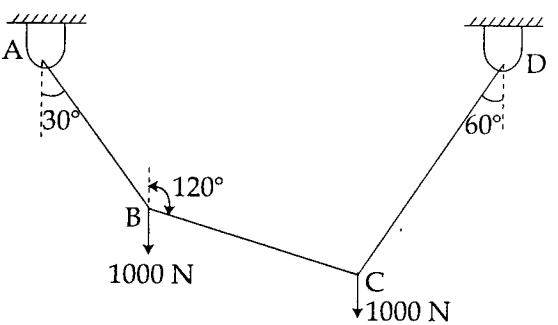

Figure - 1

4. (a) State the laws of friction. 6

(b) An effort of 200 N is required just to move a certain body up an inclined plane of angle 15°, the force acting parallel to plane. If the angle of plane is made 20°, the effort required again applied parallel to plane, is found to be 230 N. Find the weight of the body and co-efficient of friction. 8

5. The pinjointed truss ABC shown in figure 2 has a span of 5 m. It is carrying a load of 10 kN at its apex. Find the forces in members AB, AC and BC. 14

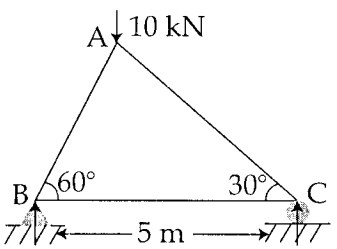

Figure - 2

6. (a) Define mechanical advantage of a machine. What is an ideal machine ? 6

(b) In a lifting machine, an effort of 31 N raised a load of 1 kN. If efficiency of machine is 0.75, what is its Mechanical Advantage ? If on this machine an effort of 61 N, raised a load of 2 kN, what is its efficiency ? What will be the effort required to raise a load of 5 kN ? 8