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BET-014

02240

Diploma in Civil Engineering / Diploma in Electrical & Mechanical Engineering

DCLEVI/DMEVI/DELVI/DECVI/DCSVI/ ACCLEVI/ACMEVI/ACELVI/ACECVI/ACCSVI

Term-End Examination

June, 2012

BET-014 : APPLIED MECHANICS

Time : 2 hours *Maximum Marks : 70*

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

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

(a) In order to determine the effects of a force acting on a body, we must know.

(i) its magnitude.

(ii) direction of line along which it acts.

(iii) its nature, wether push or pull.

(iv) point through which it acts on the body.

(v) all the above.

(b) The resultant of two forces P and Q acts at an angle (α) with P Then.

(i) $\tan \alpha = \dfrac{P \sin\theta}{P + Q\cos\theta}$

(ii) $\tan \alpha = \dfrac{P \cos\theta}{P + Q\cos\theta}$

(iii) $\tan \alpha = \dfrac{Q \sin\theta}{P + Q\cos\theta}$

(iv) $\tan \alpha = \dfrac{Q \cos\theta}{P + Q\cos\theta}$

Where θ is the angle between two forces.

(c) If a number of coplaner forces are acting simultaneously on a particle, the algebric sum of moments of all forces about any point is equal to the moments of their resultant force about the same point. This principle is known as :

(i) Principle of moments.

(ii) Principle of levers.

(iii) None of them.

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

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

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

(e) The moment of inertia of a triangular lamina of base (b) and height (h) about an axis through its centre of gravity and parallel to the base is given by the relation :

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

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

(f) A lifting machine having an efficiency less than 50% is known as

(i) reversible machine

(ii) non - reversible machine

(iii) ideal machine

(iv) none of the above

(g) The time of flight of a projectile on an upward inclined plane depends upon :

(i) angle of Projection.

(ii) angle of inclination of plane.

(iii) both (i) and (ii).

(iv) none of the above.

2. (a) State triangle law of forces and polygon law of forces. 4

(b) Four forces act on a body as shown in figure 1 below. Determine the resultant of the system of forces. 10

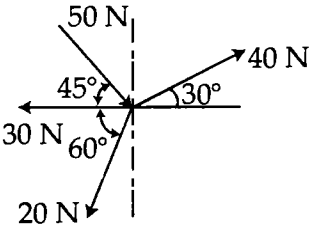

Figure - 1

3. (a) State Lami's Theorem. 4

(b) A smooth sphere weighing 400 N is resting against a smooth wall as shown in figure 2. Determine reactions at the supports. 10

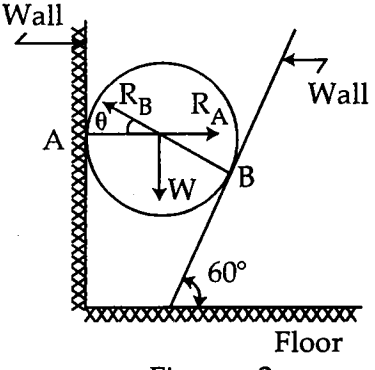

Figure - 2

4. (a) What is a truss ? Discuss its classification. 4

(b) A cantilever truss of 3m span is loaded as shown in figure 3 below. Find the forces in various members of the truss, and tabulate the results. 10

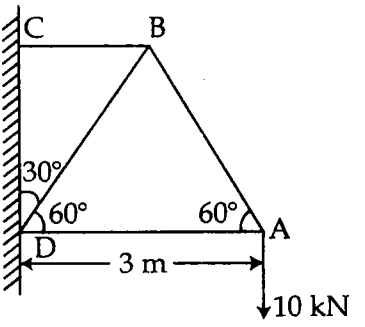

Figure - 3

5. An effort of 200 N is required just to move a certain body up a plane inclined at angle 15°, the force acting parallel to the plane. If the angle of induction of the 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 the coefficient of friction. 14

6. (a) Distinguish between centre of gravity and centroid. 4

(b) Determine the centroid of a plate with uniform mass per unit area having a shape given in Figure 4. **10**

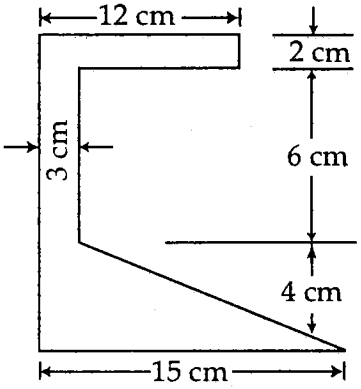

Figure - 4

7. An unequal I - Section is made of three rectangles as shown in Figure 5. Find the moment of inertia of the section about the horizontal and vertical axis passing through the centroid of the section. **14**

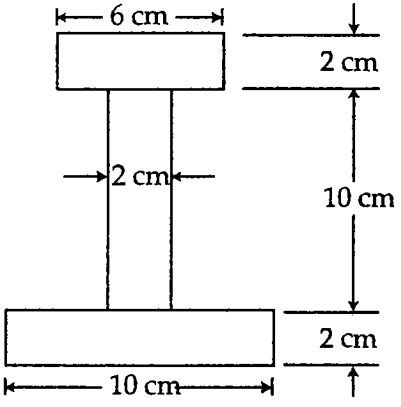

Figure - 5

8. (a) What do you understand by the term 'energy' ? Write various forms of mechanical energy. 4

(b) Calculate the work done in pulling up a block of wood weighing 2 kN for a length of 10 m on a smooth plane inclined at an angle of 15° with the horizontal. 10