Diploma in Civil Engineering / Diploma in Electrical & Mechanical Engineering

04340

Term-End Examination

December, 2010

BET-014 : APPLIED MECHANICS

Time : 2 hours *Maximum Marks : 70*

Note : Attempt question number 1. which is ***compulsory*** *and any four from the remaining. Use of calculator is allowed.*

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

   (i) A couple consists of

   (a) two like parallel forces of same magnitude.

   (b) two like parallel forces of different magnitudes.

   (c) two unlike parallel forces of same magnitudes.

   (d) two unlike parallel forces of different magnitudes.

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

   (a) no force is acting on the body.

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

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

(d) both (b) and (c)

(iii) The centre of gravity of an equilateral triangle with each side (a) is _____ from any of the three sides

(a) $\frac{a\sqrt{3}}{2}$ (b) $\frac{a\sqrt{2}}{3}$

(c) $\frac{a}{2\sqrt{3}}$ (d) $\frac{a}{3\sqrt{2}}$

(iv) The moment of inertia of triangular section of base (b) and height (h) about an axis passing through its vertex and parallel to the base is _____ as that passing through its C.G and parallel to the base is

(a) twelve times (b) nine times

(c) six times (d) four times

(v) The efficiency of a screw jack may be increased by

(a) increasing its pitch.

(b) decreasing its pitch.

(c) increasing the load to be lifted.

(d) decreasing the load to be lifted.

(vi) A framed structure is perfect, if number of members is _____ (2j-3), where j is the number of joints.

(a) less than (b) equal to

(c) greater than (d) either (a) or (c)

(vii) The maximum height of a projectile on a horizontal range is

(a) $\frac{u^2 \sin 2\alpha}{2g}$ (b) $\frac{u^2 \sin \alpha}{2g}$

(c) $\frac{u^2 \sin^2 2\alpha}{2g}$ (d) $\frac{u^2 \sin^2 \alpha}{2g}$

____ where the symbols have their usual meaning

2. (a) A uniform wheel of 600 mm diameter, weighing 5 kN rests against a rigid rectangular block of 150 mm height as shown in figure no. 1. Find the least pull, through the centre of the wheel, required just to turn the wheel 7

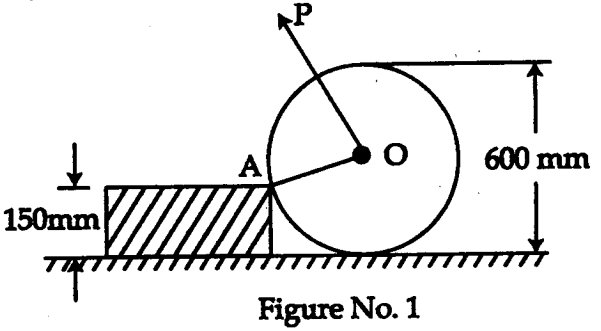

Figure No. 1

over the corner A of the block. Also find the reaction of the block. Take all the surface to be smooth.

(b) Find the reactions at support A and C of a loaded beam AB as shown in figure no 2. 7

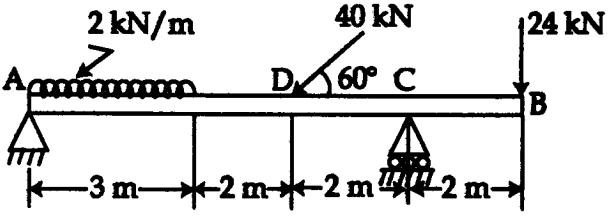

Figure No. 2

3. (a) Distinguish clearly between a "sample wheel and axle" and a "differential wheel and axle" with the help of a diagram. 7

(b) In a differential pulley block two pulleys have diameters of 20 cms and 16 cms, respectively 7

(i) Calculate the velocity ratio

(ii) Given that the efficiency at 30 kN load being 60%, calculate the effort required.

4. (a) Define 'centroid' and 'centre of gravity'. Describe briefly the various methods of finding out centre of gravity of a body. 7

(b) Find the C.G. of the Z - section shown in figure no. 3. 7

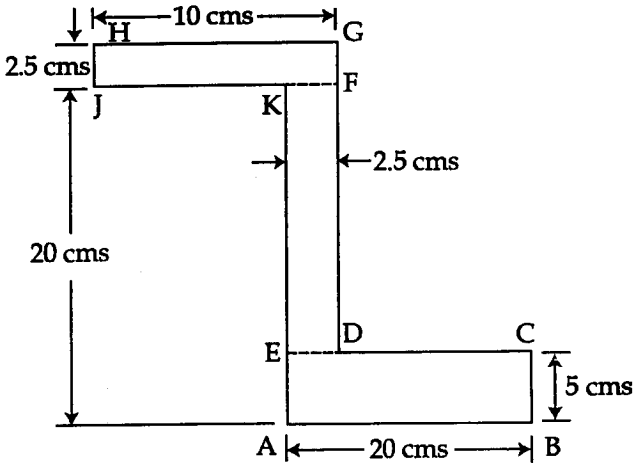

Figure No. 3

5. A cantilever truss of 3 m span is loaded as shown in figure no 4. Find the forces in various members of the framed truss, and reactions at C and D. 14

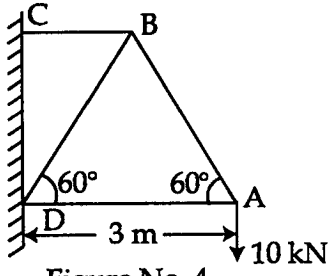

Figure No. 4

6. (a) State the theorem of Parallel axis and perpendicular axis, as applied to moment of inertia. 4

(b) An I - section is made up of three rectangles as shown in figure no. 5. Find the moment of inertia of the section about the horizontal axis passing through the c.g. of the section. 10

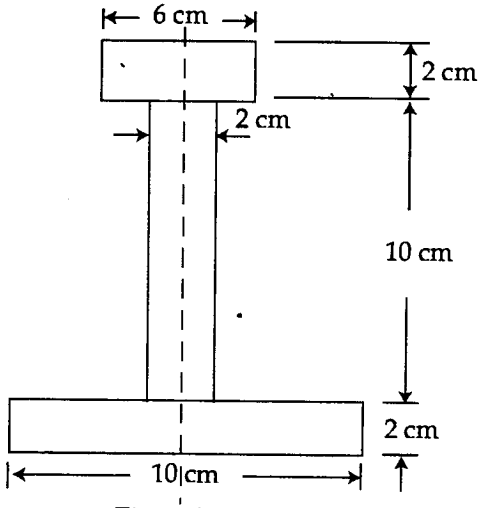

Figure No. 5

7. (a) State and explain Newton's three laws of motion. Explain the term 'conservation of energy'. 4

(b) A projectile is fired with a velocity of 500 m/s at an elevation of 30°, find the velocity and the direction of the projectile after 30 second of its firing. 10