No. of Printed Pages : 4

**BET-022**

06582

# Diploma in Civil Engineering / Diploma in Electrical and Mechanical Engineering DCLEVI/DMEVI/DELVI/DECVI/DCSVI/ ACCLEVI/ACMEVI/ACELVI/ACECVI/ACCSVI

## Term-End Examination

## December, 2011

## BET-022 : STRENGTH OF MATERIALS

*Time : 2 hours* *Maximum Marks : 70*

***Note :*** *Question **no.1 is compulsory**. Attempt **any four** questions from the remainings. Assume suitable data wherever necessary and mention it clearly. Use of scientific calculator is **allowed**.*

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

(a) The relationship between Young's modulus of elasticity E, bulk modulus K and Poisson's ratio $\mu$ is given by :

(i) $E = 2k (1-2\mu)$ (ii) $E = 3k (1+\mu)$

(iii) $E = 3k (1-2\mu)$ (iv) $E = 2k (1+\mu)$

(b) If a material has identical properties in all directions, it is said to be :

(i) homogeneous (ii) isotropic

(iii) elastic (iv) orthotropic

(c) If a point in a strained material is subjected to equal normal and tangential stresses, then the angle of obliquity is :

(i) $0°$ (ii) $45°$

(iii) $\tan^{-1}(1/2)$ (iv) $\tan^{-1}(2)$

(d) Rate of change of bending moment is equal to :

(i) shear force (ii) deflection

(iii) slope (iv) rate of loading

(e) A simply supported beam of length $l$ carries a load varying uniformly from zero at left end to maximum at right end. The maximum bending moment occurs at a distance of :

(i) $1/\sqrt{3}$ from left end

(ii) $1/3$ from left end

(iii) $1/\sqrt{3}$ from right end

(iv) $1/3$ from right end

(f) In a rectangular shaft subjected to torsion, the maximum shear stress occurs at :

(i) centre

(ii) corners

(iii) middle of smaller side

(iv) middle of longer side

(g) Deflection in a leaf spring is more if its :

(i) strength is more

(ii) strength is less

(iii) stiffness is less

(iv) stiffness is more

2. (a) A load of 5 kN is to be raised with the help of a steel wire. Find the minimum diameter of the steel wire, if the stress is not to exceed $100 \times 10^6$ N/m$^2$. 7

(b) A cast iron column has internal diameter of 200 mm. What should be the minimum external diameter so that it may carry a load of 2N, without the stress exceeding 90N/mm$^2$. 7

3. A simply supported beam 6 m long is carrying a uniformly distributed load of 2 kN/m over a length of 3 m from the right end. Draw the S.F. and B.M. diagrams for the beam and also calculate the maximum B.M. on the section. 14

4. For a given stress, compare the moments of resistance of a beam of a square section, when placed : 14

(a) with its two sides horizontal, and

(b) with its diagonal horizontal.

5. Find the maximum torque, that can be applied safely to a shaft of 500 mm diameter. The permissible angle of twist is 1.5 degree in a length of 7.5 m length and the shear stress is not to exceed 42 $N/mm^2$. Take $C = 84.4 \times 10^3$ $N/mm^2$. 14

6. A hollow alloy tube 5 m long with diameters 40 mm and 25 mm respectively was found to extend 6.4 mm under a tensile load of 6 kN. Find the buckling load for the tube, when used as a strut with both the ends pinned. Also find the safe load on the tube, taking factor of safety as 4. 14

7. A beam of triangular cross section having base width of 100 mm and height of 150 mm is subjected to a shear force of 15 kN. Find the value of maximum shear stress and sketch the shear stress distribution along the depth of beam. 14

8. Write short notes on ***any four*** of the following : **4x3½=14**

   (a) Elastic constants

   (b) Types of support

   (c) Moment of resistance

   (d) Theory of torsion

   (e) Eular's column theory

   (f) Slenderness ratio.