BET-022

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

03885

Term-End Examination

June, 2012

BET-022 : STRENGTH OF MATERIALS

Time : 2 hours   *Maximum Marks : 70*

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

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

    (a) For an isotropic, homogeneous and elastic material obeying Hooke's law, number of independent elastic constants is

        (i) 2   (ii) 3   (iii) 9   (iv) 1

    (b) The sum of normal stresses is

        (i)   constant

        (ii) variable

        (iii) dependent on the planes

        (iv) none of the above

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(c) The ratio of width to depth of the strongest beam that can be cut out of a cylindrical log of wood is

(i) $\frac{1}{2}$ (ii) $\frac{1}{\sqrt{2}}$

(iii) $\frac{1}{3}$ (iv) $\frac{2}{3}$

(d) If the length of a simply supported beam carrying a concentrated load at the centre is doubled, the deflection at the centre will become

(i) two times   (ii) four times

(iii) eight times   (iv) sixteen times

(e) If a circular shaft is subjected to a torque T and bending moment M, the ratio of maximum bending stress and maximum shear stress is

(i) $\dfrac{2M}{T}$ (ii) $\dfrac{M}{2T}$

(iii) $\dfrac{M}{T}$ (iv) $\dfrac{2T}{M}$

(f) For circular column having its ends hinged, the slenderness ratio is 160. The l/d ratio of the column is

(i) 80   (ii) 57

(iii) ·40   (iv) 20

(g) The ratio of torsional moments of resistance of a solid circular shaft of diameter D and a hollow shaft having external diameter 'D' and internal diameter 'd' is given by

(i) $\dfrac{D^4}{D^4 - d^4}$

(ii) $\dfrac{D^4 - d^4}{D^4}$

(iii) $\dfrac{D^3}{D^3 - d^3}$

(iv) $\dfrac{D^3 - d^3}{D^3}$

2. A reinforced concrete (R.C.C.) column of a square **14** cross section, 500×500 mm, is reinforced with 4 number of 25 mm dia. mild steel bars. The column is carrying a load of 200 tonnes. Find the stresses in the concrete and steel bars.

take E for steel $= 21$ kN/mm^2

and E for concrete $= 1.4$ kN/mm^2

3. A point in a mass of material is subjected to a **14** tensile stress of 60 N/mm^2 and a compressive stress of 40 N/mm^2, acting on two mutually perpendicular planes, with a shear stress of 10 N/mm^2 on these planes. Determine the principal stresses. Also find out the maximum shear stress.

4. A cantilever 1.5 m long is loaded with a uniformly **14** distributed load of 2 kN/m run over a length of 1.25 m from the free end. It also carries a point load of 3 kN at a distance of 0.25 m from the free end. Draw the S.F. and B.N. diagrams of the cantilever.

5. A beam of rectangular section 100 mm wide and **14** 240 mm deep is subjected to a bending moment of 76.8 kN-m and shear force of 96 kN. Find the principal stress at 0 (zero), 40, 80 and 120 mm above neutral axis.

6. A cantilever 120 mm wide and 200 mm deep is **14** 2.5 metres long. What uniformly distributed load should the beam carry to produce a deflection of 5 mm at the free end ?
    Take $E = 200 \times 10^3 \text{ N/mm}^2$

7. Find the maximum torque, that can be applied **14** safely to a shaft of 300 mm diameter. The permissible angle of twist is 1.0 degree in a length of 8.0 m, and the shear stress is not to exceed 40 N/mm^2. Take $C = 84.4 \text{ kN/mm}^2$.

8. Find the Euler's crippling load for a hollow **14** cylindrical steel column of 38 mm external diameter and 2.5 mm thick. Take length of the column as 2.3 m which is hinged at its both ends. Take $E = 205 \text{ KN/mm}^2$.