No. of Printed Pages : 3

BICE-008

B.Tech. CIVIL ENGINEERING (BTCLEVI)

Term-End Examination

June, 2015

00036

BICE-008 : STRUCTURAL ANALYSIS – I

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **seven** questions. Use of calculator is allowed. Assume missing data, if any.*

1. (a) What is Hooke's law and Bulk modulus of rigidity ? *3*

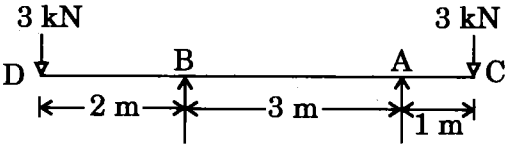
(b) Derive the expression among Young's modulus of Elasticity "E", Bulk modulus "K" and μ (Poisson Ratio) as given below :

$E = 3K(1 - 2\mu)$. *7*

2. A round bar of steel tapers uniformly from a diameter of 2·5 cm to 3·5 cm in a length of 50 cm. If an axial force of 60 kN is applied at each end, determine the elongation of the bar. Take $E = 205\ kN/mm^2$. *10*

3. A piece of metal is subjected to tensile stresses of 60 N/mm^2 and 30 N/mm^2 at right angles to each other. Find the normal and tangential stress on a plane, which makes an angle of 40° with the 60 N/mm^2 stress. *10*

4. Draw the S.F. and B.M. diagram of a beam shown below : *10*



5. (a) Explain the assumptions made in simple theory of bending. *4*

(b) A steel plate 10 cm wide and 2 cm thick is bent into a circular arc of 50 meter radius. Find the maximum intensity of bending stress. Take $E = 2{\cdot}05 \times 10^5$ N/mm^2. *6*

6. Find the maximum and minimum intensities induced on the base of a masonry wall 6 m high, 4 m wide and 1·5 m thick subjected to horizontal wind pressure of 1,500 N/m^2 acting on 4 m side. The density of masonry may be taken as 22,400 N/m^3. *10*

7. (a) What is slenderness ratio ? Discuss the different conditions of column. *4*

(b) Explain the limitations of Euler's formula in detail. *6*

8. A hollow C-I column whose outer diameter is 200 mm and has thickness of 20 mm, is 4·5 m long and is fixed at both ends. Calculate the safe load by Rankine formula using F.O.S. as 4. Take $\sigma_e = 550$ MN/m^2, $\alpha = 1/1600$. *10*

9. Derive the relation between twisting moment, twist and shear stress of a solid circular shaft as given below : *10*

$$\frac{\sigma_s}{R} = \frac{N\theta}{l} = \frac{q}{r} = \frac{T_r}{J}$$

where σ_s = maximum shear stress

R = Radius

N = Bulk modulus

θ = Twist angle

l = length of shaft

J = Polar M.O.I.

q = shear stress at a distance 'r'

10. Write short notes on any ***two*** of the following : *2×5=10*

(a) Fatigue Testing

(b) Principal Stresses

(c) Different Properties of Steel