9/5/14

Reg. No.										

B.E./B.Tech. (Full– Time) DEGREE ARREAR EXAMINATION, APRIL/MAY. 2014

IV SEMESTER

CIVIL ENGINEERING

CE281 – STRENGTH OF MATERIALS {Regulation 2004} /

CE9251 – STRENGTH OF MATERIALS – II {Regulation 2008}

Time : Three hours Maximum : 100 marks

Answer ALL questions

PART – A (10 x 2 = 20 marks)

1. State: Castigliano's theorem
2. In a simply supported beam AB, the measured deflection at a point C is 4 mm when a concentrated load of 10 kN is applied at its mid-span (D). What will be the deflection at mid-span (D) in the above beam if a concentrated load of 7 kN is applied at C?
3. Write the end moments in a fixed beam when one of its supports rotates by an amount 'θ'.
4. What are the merits of theorem of three moments?
5. What are the limitations of Euler's column theory?
6. Show the core of the following column sections (i) rectangular (ii) circular.
7. How volumetric and linear strains are related?
8. List the various theories of failure applicable for ductile materials.
9. What are the causes for unsymmetrical bending of beams?
10. What is meant by fatigue limit?

PART – B (5 x 16 = 80 marks)

11. Derive an expression for Euler's critical load of a column with one end fixed and the other end hinged from first principles.

12. (a) A cantilever of span "L" carries a point load "W" at its free end and another point load "2W" at its mid span. Determine the deflection at the free end using strain energy method. Take the flexural rigidity for the half length from fixed end as "2EI" and for the remaining length as "EI".

(Or)

(b) Determine the vertical deflection at the free end of the cantilever truss shown in Fig.Q12(b). Take cross sectional area of compression members as 850 mm^2 and tension members as 1000 mm^2. Modulus of elasticity, E = 210 GPa for all the members.

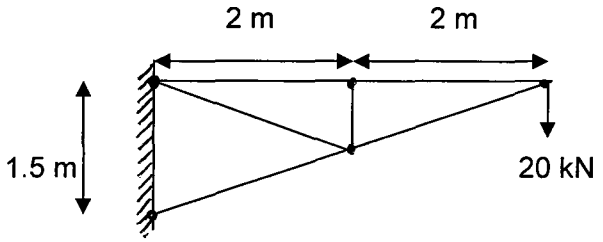

Fig.Q.12(b)

13. (a) A fixed beam AB of span 4 m and uniform cross section is carrying a uniformly distributed load of 10 kN/m over the left half span. Draw the shearing force and bending moment diagrams.

(Or)

(b) A continuous beam ABC of uniform section is fixed at A and simply supported at B and C. The spans AB and BC are 6 m and 5 m respectively. The span AB carries a uniformly distributed load of 8 kN/m and the span BC carries a concentrated load of 10 kN at 3 m from C. Analyze the beam by theorem of three moments and draw the shearing force and bending moment diagrams.

14. (a) Determine the principal stresses for the state of stress at a point characterized by the components shown below as stress tensor.

$$\begin{matrix} 16 & -8 & 10 \\ -8 & 12 & -4 \\ 10 & -4 & 6 \end{matrix} \quad N/mm^2$$

(Or)

(b) A bolt is acted upon by an axial pull of 20 kN along with a transverse shear of 8 kN. Determine the diameter of the bolt based on the following theories of failure: (i) maximum principal stress theory, (ii) maximum shear stress theory, (iii) maximum strain energy theory and (iv) maximum shear strain energy theory. Elastic limit of the bolt material is 220 MPa and a factor of safety of 2.5 is to be taken. Take Poisson's ratio (μ) as 0.25.

15. (a) A curved bar of rectangular section of 30 mm width, 40 mm depth and mean radius of curvature of 60 mm is initially unstressed. If a bending moment of 400 Nm is applied to the bar which tends to straighten it, determine the stresses at the inner and outer surfaces and sketch a diagram to show the variation of stress across the section.

(Or)

(b) A compound cylinder is made by shrinking a tube of 160 mm final internal diameter and 20 mm thick over another tube of 160 mm external diameter and 20 mm thick. The radial pressure at the common surface, after shrinking is 8 N/mm^2. Determine the final stresses setup across the section when the compound cylinder is subjected to an internal fluid pressure of 60 N/mm^2.