Reg. No.										

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

IVSEMESTER

CIVIL ENGINEERING

CE 8403 – STRENGTH OF MATERIALS - II

{Regulation 2012}

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART – A (10 x 2 = 20 marks)

1. Determine the strain energy stored in a cantilever beam when it is subjected to a point load 'W' at the free end. Assume that the beam has uniform flexural rigidity throughout
2. State principle of virtual work.
3. What is the value of maximum deflection induced in a fixed beam when it is subjected to a point load at mid-span?
4. How do you analyze a fixed beam using theorem of three moment equations?
5. Define effective length of a column and mention the effective length of columns for various end conditions.
6. What do you mean by core of a column section?
7. What are the stress invariants for a three dimensional state of stress?
8. State the criteria for failure of a material based on total strain energy theory.
9. Define: shear centre.
10. Write short notes on "shrinkage allowance of a compound cylinder".

PART – B (5 x 16 = 80 marks)

11. A horizontal beam of uniform section and 6 m long is simply supported at its ends. The beam is subjected to a point load of 16 kN at 4 m from the left end. Find the deflection at mid span using energy method.

12. (a) A propped cantilever AB of span 4 m (fixed at the left end A and propped at the right end B) is subjected to a uniformly distributed load of 10 kN/m over the left half span. Determine the reaction at the prop and draw the bending moment diagram.

(Or)

(b) A continuous beam ABCD of uniform section and length 12 m is fixed at A and simply supported at B and C. The spans AB and BC are 6 m and 5 m respectively and the portion CD is overhanging. The beam carries a uniformly distributed load of 6 kN/m in the span AB, a central concentrated load of 12 kN in the span BC and a point load of 4 kN at D . Analyze the beam by theorem of three moments and draw the shearing force and bending moment diagrams.

13. (a) (i) what are the assumptions made in Euler's column theory? (6)

(ii) Derive expression for Euler's crippling load of a column with both ends hinged from first principles. (10)

(Or)

(b) A 4 m long hollow cylindrical cast iron column with both ends fixed supports an axial load of 1000 kN. The external diameter of the column is 200 mm. Determine the thickness of the column using Rankine's formula by taking the Rankine's constant as 1/6400 and working crushing strength of material as 78 N/mm^2.

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

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

(Or)

(b) The major principal stress on an element of a steel member is 200 N/mm^2 (tensile) and the minor principal stress is compressive. If tensile yield point of steel is 300 N/mm^2, find the minor principal stress at which failure will occur according to the following theories of failure: (i) maximum shear stress theory and (ii) maximum strain energy theory. Take Poisson's ratio, $\mu = 0.25$.

15. (a) Locate the shear centre for a channel section which has 100 mm wide flanges and 200 mm overall depth. Take the thickness of flanges and web as 2 mm.

(Or)

(b) A thick pipe of 300 mm outer diameter and 200 mm inner diameter is subjected to an internal pressure of 12 MPa. What minimum external pressure can be applied so that the tensile stress in the metal shall not exceed 16 MPa?