Reg.No.										

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

II SEMESTER

CIVIL ENGINEERING

PTCE8203 – STRENGTH OF MATERIALS –II {Regulations 2013}

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 carries a point load at the free end.
2. State Engessor's theorem.
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. Write the end moments Induced In a fixed beam when one of its supports sinks.
5. Define effective length of a column.
6. State Middle third rule.
7. What are principal planes?
8. List the various theories of failure applicable to ductile materials.
9. What are the causes for unsymmetrical bending of beams?
10. State the assumptions made in Winkler Bach theory for curved beams?

PART – B (5 x 16 = 80 marks)

11. A horizontal beam of uniform section and 4 m long is simply supported at its ends and subjected to a uniformly distributed load of 8 kN/m over the left half span. Determine the slope and deflection at mid span of the beam using strain energy method.

12. (a) A fixed beam AB of span 5 m carries a point load 12 kN at 2 m from the left end. Analyze the beam and draw the shearing force and bending moment diagrams.

(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 over 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) Determine the section of a cast iron hollow cylindrical column 3 m long with both ends fixed , if it carries an axial load of 800 kN. The ratio of internal to external diameter of the column is 5/8. Use Rankine's formula by taking the Rankine's constant as 1/1600 and working crushing strength of material as 550 N/mm^2.

14. Determine the principal stresses and principal planes for the state of stress at a point shown below as stress tensor.

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

(Or)

(b) A bolt is acted upon by an axial pull of 16 kN along with a transverse shear of 10 kN. Determine the diameter of the bolt based on the following theories of failure: (i) maximum principal stress theory, (ii) maximum shear stress theory, (ii) maximum strain energy theory and (iv) maximum shear strain energy theory. Elastic limit of the bolt material is 250 MPa and a factor of safety of 2.5 is to be taken. Take Poisson's ratio (μ) as 0.25.

15. A rectangular beam, 80 mm wide and 120 mm deep is used as a simply supported beam over a span of 8 m. Two loads of 4 kN each are applied to the beam symmetrically, each load being 2 m from the support. The plane of the loads makes an angle 30° with the vertical plane of symmetry. Find the direction of neutral axis and calculate the bending stress induced at each corner of the beam section.

(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?