Reg. No. | | | | | | | | | | | | |

Question Paper Code : 51249

B.E/B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016

Fourth Semester

Civil Engineering

CE 2252/CE 43/10111 CE 403/080100019 – STRENGTH OF MATERIALS

(Regulations 2008/2010)

Time : Three Hours **Maximum : 100 Marks**

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. Define the terms : Resilience and Modulus of Resilience.
2. State Castigliano's first and second theorem for strain energy.
3. A cantilever beam 4 m long carries a gradually varied load. Zero starts at free end to 3 kN/m at the fixed end. Draw the SFD and BMD for the beam.
4. Give the two stages to draw BMD for a continuous beam under any system of loading.
5. What are the assumptions made in Euler's column theory ?
6. Explain briefly about Middle third rule.
7. What is principal plane and principal stress ?
8. What do you meant by tri-axial state of stress ?
9. Site the conditions of unsymmetrical bending sections.
10. Write the expression for Winkler batch formula.

PART – B (5 × 16 = 80 Marks)

11. (a) A simply supported beam of span 3 m is carrying a point load of 20 kN at 1 m from the left support in addition to a u.d.l of 11 kN/m spread over the right half span. Using Castigliano's theorem, determine the deflection under the point load. Take EI is constant throughout. **(16)**

OR

(b) Determine the vertical deflection at the free end of the cantilever truss shown in Fig. Q 11 (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. **(16)**

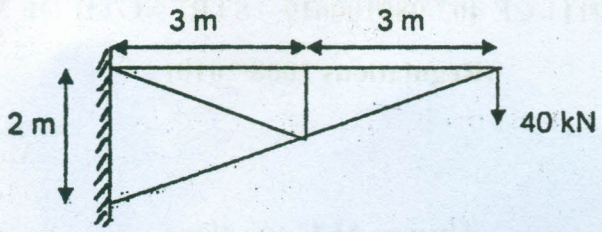

Fig. Q. 11 (b)

12. (a) A continuous beam ABC of uniform section, with span AB and BC as 6 m each, is fixed at A and supported at B and C. Span AB carries UDL of 2 kN/m and BC having a midpoint of 12 kN. Find the support moments and the reactions. Also draw the SFD and BMD of the beam. **(16)**

OR

(b) What is the Clapeyron's theorem of three moments ? Derive an expression for Claperyron's theorem of three moments. **(16)**

13. (a) Derive an expression for Euler's crippling load when one end of column is fixed and other end is hinged. **(16)**

OR

(b) A thick walled steel cylindrical shell of internal diameter 150 mm and external diameter 500 mm is subjected to fluid pressure of 100 MPa. Calculate the principal stress and maximum shear stress at a point on the inside surface of the cylinder and calculate the increase in inside diameter due to fluid pressure. Assume E = 200 kN/mm^2 and 1/m = 0.3. **(16)**

14. (a) The principal tensile stresses at a point across two perpendicular planes are 120 MN/m^2 and 60 MN/m^2. Find

(i) the normal and tangential stress and the resultant stress and its obliquity on a plane at 20° with the major principal plane. **(8)**

(ii) the intensity of stress which acting alone can produce the same maximum strain., Take Poisson's ratio = 1/4. **(8)**

OR

(b) The inside and outside diameters of a cast-iron cylinder are 240 mm and 150 mm respectively. If the ultimate strength of a cast-iron is 180 MN/m^2 find, according to each of the following theories the internal pressure which would cause rupture

(i) maximum principal stress theory,

(ii) maximum strain theory and

(iii) maximum strain energy theory.

Poisson's ratio = 0.25. Assume no longitudinal stress in the cylinder.

15. (a) A closed ring of mean radius of curvature 90 mm is subjected to a pull of 3 kN. The line if action of the load passes through the centre of the ring. Calculate the maximum tensile and compressive stress in the material of the ring is Circular in cross-section with diameter equal to 15 mm. **(16)**

OR

(b) A cantilever of length 1 m carries a point load of 200 N at the free end. The cross-section of the cantilever is an unequal angle of dimensions 100 mm by 60 mm and 10 mm thick. The small leg 60 mm of the angle is horizontal. The load passes through the centroid of the cross-section. Determine :

(i) position of neutral axis. **(8)**

(ii) the magnitude of maximum stress setup at the fixed section of the cantilever. **(8)**
