Reg. No. :

Question Paper Code : 52240

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017
Third Semester
Civil Engineering
CE 2201 – MECHANICS OF SOLIDS
(Regulations 2008)
(Common to PTCE 2201 – Mechanics of Solids for BE (Part – Time) Third Semester – Civil Engineering – Regulations 2009)

Time : Three Hours | Maximum : 100 Marks

Answer ALL the questions and missiong data may be appropriately assumed.

PART – A **(10×2=20 Marks)**

1. What do you mean by a stable structure ?
2. Write a mathematical expression for relative elongation.
3. State the main principle involved in analysis of plane-trusses by method of joints.
4. Give a mathematical expression for the longitudinal shear stress developed in a pressurized close pipe.
5. Draw the BMD for a cantilever of span 1 m carrying a central moment-couple of 1 kNm.
6. Mention the two examples for the proportional beam.
7. Sketch the conjugate beam for a cantilever beam.
8. Define shear-center in a beam section.
9. Highlight the critical merits of hollow-shafts over solid-shafts.
10. What do you understand by proof-load for a leaf-spring ?

PART – B **(5×16=80 Marks)**

11. a) i) Appropriately define the terms : stability, strength and stiffness of a structural element. **(6)**

ii) With usual notations, obtain a mathematical expression connecting the three modulii of elasticity. **(10)**

(OR)

b) i) Draw thestress-strain curve for a mild-steel material indicating the salient points in it. **(4+4)**

ii) A machine element is subjected to pure-shear state of stress on it with a magnitude of MPa. Determine the principal stresses and the principal planes in it. **(4+4)**

12. a) i) Enlist the assumptions made in the analysis of plane-trusses. **(6)**

ii) Starting from first principles, obtain the mathematical expression for the Hoop-and longitudinal stresses developed in a long closed pipe subjected to an internal fluid pressure. **(5+5)**

(OR)

b) By method of sections, analyze the plane-truss shown in Fig. 1 and also, tabulate the member forces developed in it . **(12+4)**

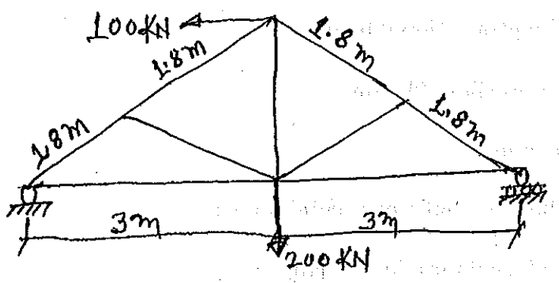

Fig. 1

13. a) Analyze the double-overhanging beam shown in Fig. 2 and draw the SF and BMDs indicating the salient values in them. **(4+6+6)**

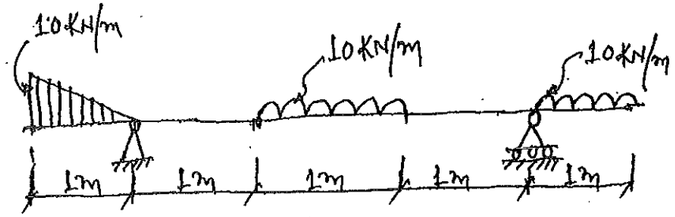

Fig. 2

(OR)

b) With usual notations, derive the simple bending equation with clearly stating the assumptions made in it. **(6+10)**

14. a) i) Appropriately state the two theorems of the area-moment method and also, explain how these are useful in the calculations of slope and deflections in beams. **(6+3)**

ii) Prove that the maximum shear stress developed in a rectangular beam section is 150% of the average shear stress developed at that section. **(7)**

(OR)

b) i) By conjugate-beam method, find the slope and deflection at the free-end of the prismatic cantilever shown in Fig. 3. **(5+5)**

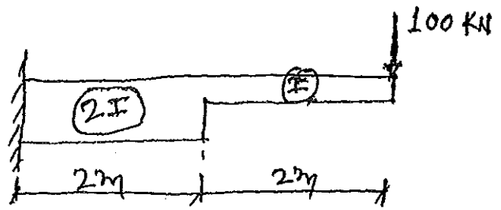

Fig. 3

ii) Show that the maximum shear stress developed in a circular beam section is 125% of the average shear stress developed at that section. **(6)**

15. a) With usual notations, derive the simple torsion equation with clearly stating the assumptions made in it. **(6+10)**

(OR)

b) i) Analyze the fixed-shaft of diameter 'd' and length 'l' carrying a central twisting torque of 'T'. Also, draw the torque-diagram for the fixed-shaft. **(7+3)**

ii) State the practical uses of leaf-spring, open-coiled, closely-coiled helical springs in appropriate fields of engineering. **(3×2)**
