15. a) For a two-dimensional state of stress on an element, deduce the necessary mathematical equations for the principal stresses and maximum shear stresses. **(6+7)**

(OR)

b) Analyze the plane-truss shown in Fig. 5 and appropriately tabulate the forces developed in it. Use method of sections. **(10+3)**

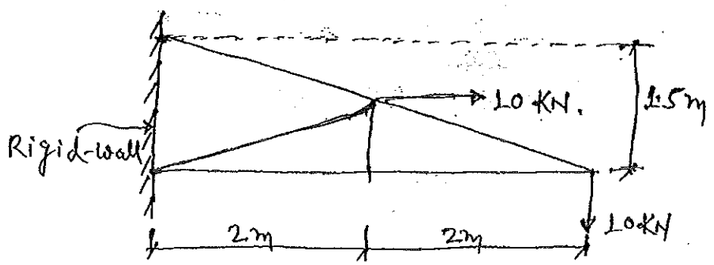

Fig. 5

PART – C **(1×15=15 Marks)**

16. a) Sketch the bending stress distribution in the beam shown in Fig. 3, at a section where maximum value of the bending moment of stress in the beam. Take the beam section as 150 mm wide and 300 mm deep. **(5+5+5)**

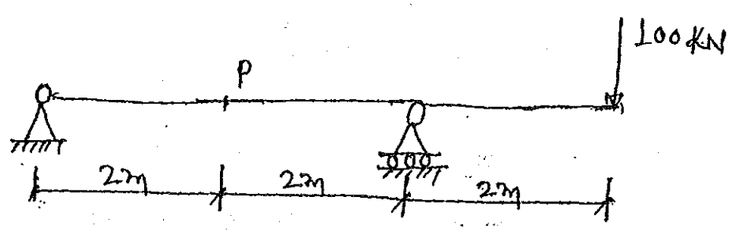

Fig. 3

(OR)

b) A 150 mm wide and 200 mm deep wooden beam is reinforced at the bottom by a steel plate of 150 mm wide and 10 mm thick. If the allowable stress in wood is 6 MPa. Find the moment of resistance of the beam. Take the modular ratio of the materials as 15. **(7+8)**

Reg. No. :

Question Paper Code : 50254

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017
Third Semester
Civil Engineering
CE 6302 – MECHANICS OF SOLIDS
(Regulations 2013)
(Common to Environmental Engineering)

Time : Three Hours Maximum : 100 Marks

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

PART – A **(10×2=20 Marks)**

1. Give an example for impact and suddenly applied loads.
2. What do you understand by resilience ?
3. Draw the BMD for a cantilever of 1 m span carrying a clockwise moment couple of 1 kNm at its free-end.
4. Schematically sketch the shear stress distribution across a rectangular beam section.
5. Write a mathematical expression for the maximum slope in a simply supported beam carrying an UDL throughout on it.
6. State the moment area theorem pertaining to the calculation of slope in beams.
7. Mention the principle involved in elastic theory of torsion.
8. Under what circumstances, parallel spring systems are recommended ?
9. What do you mean by a perfect plane-truss ?
10. Find the maximum shear stress developed in a pure shear stress state of system.

PART – B (5×13=65 Marks)

11. a) i) From the observations of stress-strain curves of mild-steel, TOR steel, and concrete, what are all the distinguishing features can be observed ? (3×2)

ii) Starting from first principles, obtain the appropriate mathematical expressions for the closed-thin cylinder subjected to internal fluid pressure. (3+4)

(OR)

b) A compound bar with loading is shown in Fig. 1 What is the relative position of point B with respect to point A ? Take the Young's modulus of elasticity of the bar as 210 GPa. (13)

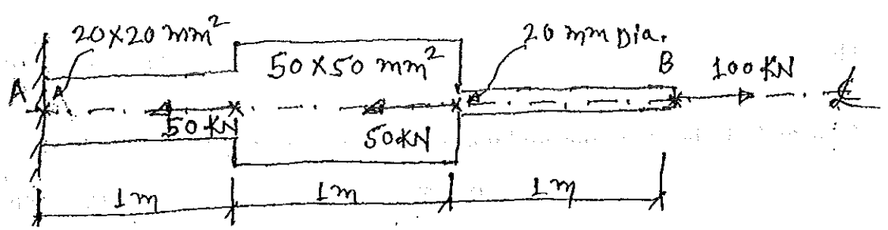

Fig. 1

12. a) Analyze the beam shown in Fig. 2 and draw the BMD indicating the salient points in it. (3+6+4)

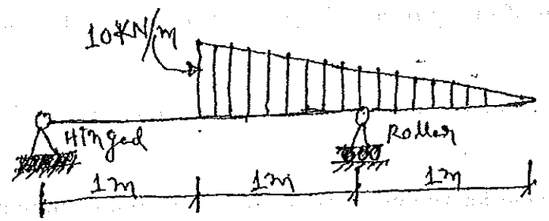

Fig. 2

(OR)

b) A 160 mm wide and 200 mm deep timber beam is to be reinforced by bolting on two steel flitches each 160 mm × 10 mm in section. Find the moment of resistance when the :

i) Flitches are attached symmetrically at the top and bottom, and

ii) Flitches are attached symmetrically at the sides. Take the modular ratio of the materials as 20 and allowable stress in timber is 6 MPa. (6+7)

13. a) By area-moment method, find the deflection at the mid-span (P) of the prismatic and homogeneous beam shown in Fig. 3. (13)

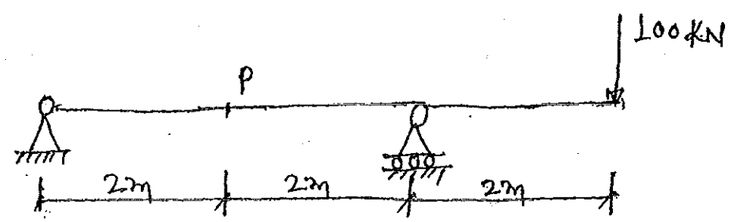

Fig. 3

(OR)

b) By conjugate beam method, find the slope at the mid-span of the prismatic and homogeneous cantilever beam shown in Fig. 4. (13)

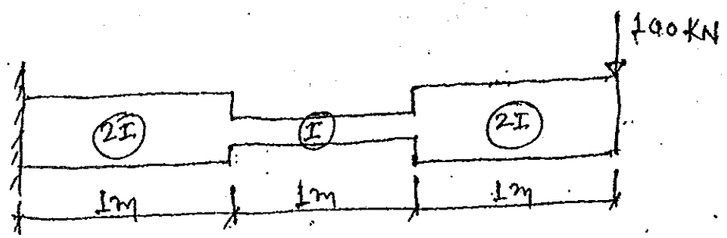

Fig. 4

14. a) A solid steel-shaft of 30 mm diameter is fixed at one end and free at the other end. If it is subjected to a clock wise torque of 100 kNm and carrying a load of 100 kN at the free-end, find the maximum shear stress developed in the shaft. (13)

(OR)

b) Appropriately analyse the spring-systems, if they are in :

i) series and

ii) parallel. (6+7)