

**PARUL UNIVERSITY**  
**FACULTY OF ENGINEERING & TECHNOLOGY**  
**B.Tech. Winter 2019 - 20 Examination**

**Semester: 3****Subject Code: 203104207/03104203****Subject Name: Introduction to Solid Mechanics/ Structural Analysis - I****Date: 02/12/2019****Time: 2:00 pm to 4:30 pm****Total Marks: 60****Instructions:**

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

**Q.1 Objective Type Questions** (All are compulsory) (Each of one mark)**(15)**

1. In a cantilever beam, fibers above the neutral axis are in  
 2. (a) Tension (b) Shear (c) Compression (d) None
2. On a principal plane, the magnitude of shear stress will be equal to:  
 (a) Maximum (b) Minimum (c) Zero (d) Infinity
3. A Redundant frame/truss is also called  
 (a) Perfect (b) imperfect (c) Deficient (d) none of these
4. In triangular section, the maximum shear stress occurs at,  
 (a) Apex of triangle (b) Mid height (c) 1/3 of the height (d) Base of triangle
5. At neutral axis bending stress is  
 (a) Minimum (b) Maximum (c) Zero (d) Infinity
6. The moment of inertia of a circular section of diameter(d) is
7. The formula for bending equation is
8. The angle between major principal plane and minor principal plane will be always
9. Maximum moment for a cantilever beam with uniformly distributed load 'w' over its entire span 'l'
10. For a circular section, the ratio of maximum shear stress to the average shear stress is
11. Define torsion in a shaft.
12. What is hoop stress in thin cylinder?
13. Eccentricity limit for a rectangular column section is
14. The methods which are employed for finding out the forces in a truss are
15. What do you mean by Structural Vibration?

**Q.2** Answer the following questions. (Attempt any three)**(15)**

- A) What do you mean by the terms Principal stress, Principal plane and angle of obliquity?
- B) Explain theory of pure bending of beams and write assumptions in theory of pure bending.
- C) What is the difference between free vibrations and forced vibrations?
- D) Explain the term truss and the types of truss with neat diagrams.

**Q.3** A) A rectangular beam of 8 m span is simply supported at its ends. The cross section of the beam is 200 mm wide and 400 mm deep. It is loaded by central point load of 200 kN and a UDL of 10kN/m on entire span. Find the maximum bending stress developed at mid span. Draw stress diagram. **(07)**

B) A rectangular section is 360 mm wide and 200 mm thick. It carries an eccentric load of 360 kN acting on the axis bisecting the width. If the maximum stress induced is 12.5 MPa, then find minimum stress and eccentricity of load. **(08)**

**OR**

B) A beam of length 6 m is simply supported at its ends and carries two point loads of 48kN and 40kN at a distance of 1 m and 3 m respectively from the left support. Find deflection under each load. (08)

Q.4 A) The ultimate stress, for a hollow steel column which carries an axial load of 1.9 MN is 480 N/mm<sup>2</sup>. If the external diameter of the column is 200 mm, determine the internal diameter. Take the factor of safety as 4. (07)

**OR**

A) Derive of equation of shear stress produced in a circular shaft subjected to torsion. (07)

B) A truss of span 10 m is loaded at joint C with 5kN and at joint D with 6 kN as shown in figure. (08)  
Find the reactions and forces in the members of the truss.

