**Seat No: _____** **Enrollment No: _____**

# PARUL UNIVERSITY

## FACULTY OF ENGINEERING & TECHNOLOGY

**B.Tech. Summer 2018- 19 Examination**

**Semester: 3** **Date: 29/05/2019**
**Subject Code: 03104205** **Time: 02:00 pm to 04:30 pm**
**Subject Name: Advanced Mechanics of Solids** **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** (Each of one mark) **(15)**

1. Shear strain energy theory is also known as _____.

2. The expression for strain energy stored in a body when the load is applied with impact is _____.

3. The section modulus of a circular section of diameter, d is _____.

4. A simply supported beam loaded with a central point load will have minimum slope at _____.

5. The torsion equation is given by _____.

6. The longitudinal stress in a thin cylindrical shell of diameter (D), length (L) and thickness (t), when subjected to an internal pressure (p) is _____.

7. Define principal stresses.

8. A cantilever beam of length, l carries a point load, W at free end. The downward deflection at free end is equal to _____.

9. Define Resilience.

10. The normal stress on an oblique plane at an angle θ to the cross-section of a body which is subjected to a direct tensile stress, σ is _____.

11. When a simply supported beam is loaded with UDL over entire span, maximum tensile stress shall develop at
(A) bottom fibre (B) centre of gravity
(C) top fibre (D) neutral axis

12. For a rectangular section, the ratio of maximum shear stress to the average shear stress is
(A) 2.0 (B) 1.5
(C) 1.25 (D) 1.75

13. A close –coiled helical spring is cut into two equal parts. The stiffness of the resulting springs will be
(A) same (B) double
(C) half (D) one-fourth

14. On a principal plane, the magnitude of shear stress will be
(A) maximum (B) minimum
(C) zero (D) infinity

15. At neutral axis, bending stress is
(A) minimum (B) maximum
(C) zero (D) none of these

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

A) A steel rod is 2m long and 50mm in diameter. An axial pull of 100kN is suddenly applied to the rod. Calculate the instantaneous stress induced and also the instantaneous elongation produced in the rod. Take E = 200 x $10^3$ N/$mm^2$.

B) A cylinder of internal diameter 2.5m and of thickness 5cm contains a gas. If the tensile stress in the material is not to exceed 80 N/$mm^2$, determine the internal pressure of the gas.

C) Derive the expression for circumferential stress for a thin cylindrical vessel subjected to an internal fluid pressure, p.

D) A cantilever beam of span 3m and 30cm x 60cm rectangular section carries a uniformly distributed load of 40kN/m on entire span. Find the maximum bending stress and draw stress distribution diagram for the beam.

**Q.3** A) An unknown weight falls through a height of 10mm on a collar rigidly attached to the lower end of a vertical bar 500cm long and 600$mm^2$ in section. If the maximum extension of the rod is to be 2mm, what is the corresponding stress and magnitude of the unknown weight? Take E = 2 x $10^5$ N/$mm^2$. **(07)**

B) A beam of length 6m is simply supported at its ends and carries two point loads of 48kN and 40kN at a distance of 1m and 3m respectively from the left support. Find the deflection under 48kN load. **(08)**
Given: E = 2 x$10^5$ N/$mm^2$ and I = 85 x $10^6$ $mm^4$.

**OR**

B) A rolled steel joist of I section overall 300mm deep x 110mm wide has flange and web of 10mm thickness. If permissible shear stress is limited to 100N/mm2, find the value of uniformly distributed load the section can carry over a simply supported span of 6m. **(08)**

**Q.4** A) Derive the formula for shear stress produced in a circular shaft subjected to torsion. **(07)**

**OR**

A) Draw the graphical representation of Maximum principal stress theory and Maximum principal strain theory for two dimensional stress system. **(07)**

B) Derive the formulae for normal and tangential stresses for a member subjected to like direct tensile stresses in two mutually perpendicular directions. **(08)**