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

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

B.Tech. Winter 2019 – 20 Examination

Semester: 3 **Date: 29/05/2019**
Subject Code: 03104205 **Time: 2:00pm to 4:30pm**
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 - **(15)**

1.Define principal stress.
2.The bending/flexure equation is _____.
3. What is meant by resilience?
4.The deflection at the center of a simply supported beam of span 'L' carrying a uniformly distributed load 'w' over the entire span is given by _____.
5.The bending stress on the neutral axis is always _____.
6.Shear strain energy theory is also known as _____.
7.What is the formula for section modulus of a circular section of diameter,'d'?
8._____ is a graphical method of finding normal, tangential and resultant stresses on an oblique plane.
9.The expression for instantaneous stress induced in a body when the load is applied with an impact is _____.
10.The torsion equation is given by _____.
11.When a closely coiled helical spring is subjected to an axial load, it is said to be under:
(a) bending (b) torsion (c) shear (d) all of these
12.Shear stress variation is
(a) Linear (b) Polynomial (c) Parabolic (d) None
13.The maximum slope of a cantilever beam carrying a point load at its free end is at the
(a) fixed end (b) center of span (c) free end (d) none of these
14.Stress on an object due to sudden load is _____ the stress induced when the load is applied gradually.
(a) equal to (b) half (c) twice (d) thrice
15.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

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 cylindrical pipe of diameter 1.5 m and thickness 1.5 cm is subjected to an internal fluid pressure of 1.2 N/mm^2. Determine longitudinal and circumferential stress developed in the pipe.

C)Draw and explain the graphical representation of maximum principal stress theory for two dimensional stress system.

D) The stresses at a point in a bar are 200 N/mm^2 (tensile) and 100 N/mm^2 (compressive). Determine the resultant stress in magnitude and direction on a plane inclined at 60° to the axis of major stress. Also determine the maximum intensity of shear stress in the material at that point.

Q.3 A) Derive the expression for deflection of a simple supported beam subjected to uniformly distributed load over entire span. **(07)**

B) An I section beam having flange dimensions as 150 mm x 20 mm is having 350 mm overall depth. The width of the web is 10 mm. If the shear force acting on the section is 40 kN, sketch the shear stress distribution across the section with relevant values. **(08)**

OR

B) Derive expression for normal and tangential stress at an inclined plane for a member subjected to a simple shear stress. **(08)**

Q.4 A) A solid steel shaft has to transmit 75kW at 200 rpm. Taking allowable shear stress as 70 N/mm^2, find suitable diameter for the shaft, if the maximum torque transmitted at each revolution exceeds the mean by 30%. **(07)**

OR

A) A rectangular beam 300mm deep is simply supported over a span of 4m. Determine the uniformly distributed load per metre which the beam may carry, if the bending stress should not exceed 120 N/mm^2. Take $I = 8 \times 10^6$ mm^4. **(07)**

B) A load of 100N falls through a height of 2cm on to a collar rigidly attached to lower end of a vertical 1.5m long and of 1.5cm^2 cross sectional area. The upper end of the vertical bar is fixed. Determine (i) maximum instantaneous stress induced in the vertical bar, (ii) maximum instantaneous elongation, and (iii) strain energy stored in the vertical rod. Take $E = 2 \times 10^5$ N/mm^2. **(08)**