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

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

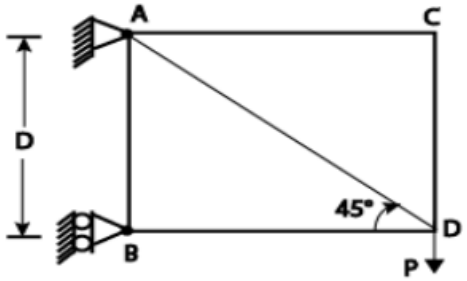
B.Tech. Summer 2022 - 23 Examination

Semester: IV **Date: 27/3/2023**
Subject Code: 203101263 **Time: 2:00 pm to 4:30 pm**
Subject Name: Aircraft Structure-I **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** - (Fill in the blanks, one word answer, MCQ-not more than Five in case of MCQ) (All are compulsory) (Each of one mark) **(15)**

1. Stress is directly proportional to strain within:
   A. Yield Point B. Elastic Point C, Plastic Point D. All of the above
2. Principal planes are the planes on which
   A. Direct stress is maximum B. Direct stress is minimum
   C. Shear stress is zero D. All of the above
3. A bar of cross-section A and length L is subjected to an axial load W. the strain energy stored in the bar would be _____
   A. WL / AE B. W^2L / 4AE C. W^2L / 2AE D. WL / 4AE
4. Stress in a beam due to simple bending is _____
   A. Directly proportional to bending B. Inversely proportional to bending
   C. Curvilinearly related to bending D. None of the mentioned
5. Torque is _____ moment.
   A. Twisting B. Shear C. Bending D. Couple
6. In cantilever beams, the deflection is zero at _____
7. The maximum induced _____ stresses should be within the safe permissible stresses to ensure strength of the beam.
8. A simple support offers only _____ reaction normal to the axis of the beam.
9. Mathematically, strain energy =
10. The shear stress is _____ at the axis of the shaft.
11. The power transmitted in the shaft at 150 rpm when subject to torque of 9000Nm is --------.
12. What is the torsional rigidity of the shaft?
13. Define principal planes?
14. Define modulus of elasticity?
15. The strain energy stored in member 'AB' of the pin jointed truss shown aside when 'E' and 'A' are for all members is, assume D= L

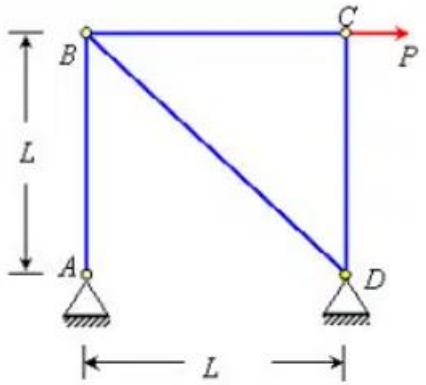


A. $P^2L/2AE$ B. P^2L/AE C. $2P^2L/AE$ D. Zero

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

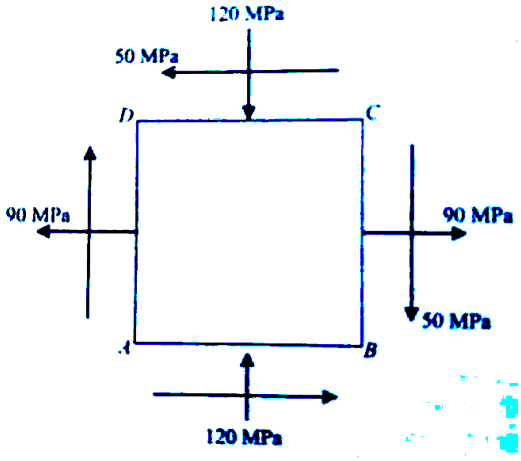
A) State the assumptions made in simple theory of bending.
B) Define normal or direct stress and strain? How they are related. A MS bar carries an axial load of 75 kN. If the allowable tensile stress is 50 N/mm^2, find the diameter of the rod.
C) What do you mean by determinate and indeterminate structures? Explain with suitable examples.

D) Determine the total strain energy stored in the pin jointed framework as shown below.



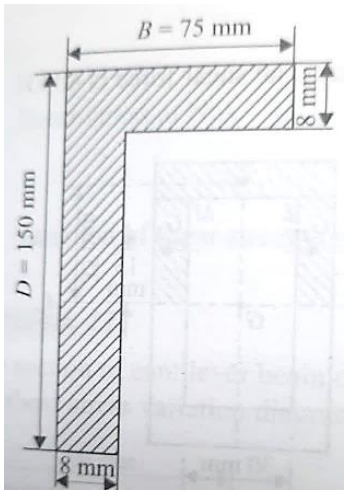
Q.3 A) A timber beam of rectangular section is to support a load of 20KN uniformly distributed over a span of 3.6m when beam is simply supported. If the depth is to be twice the breadth, and the stress in timber is not exceed 7N/mm^2, find the dimensions of the cross section. How could you modify the dimensions with 20KN of concentrated load is present at centre with same breadth and depth ratio. **(07)**

B) At a point in a strained material the horizontal tensile stress is 90 MPa and vertical compressive stress is 120 MPa. The shear stress is 50 MPa. Find the principal stress and direction of principal planes. Also determine the magnitude of normal and tangential stresses on a plane inclined 30° with the plane of compressive stress. **(08)**



OR

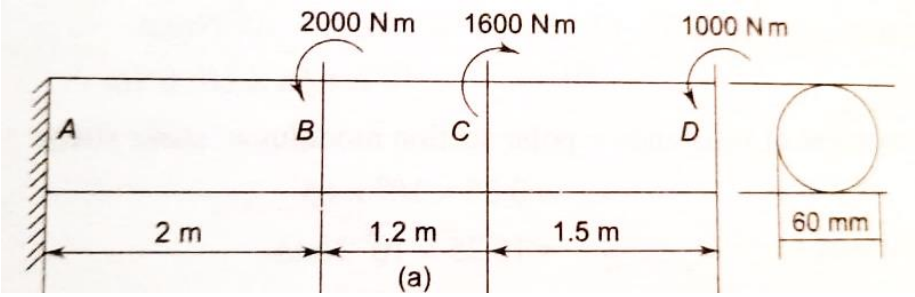
B) An unequal angle 150 mm x 75 mm, thickness of metal 8 mm, with the longer leg vertical is used as a beam and carries a load of 6 kN/m over the span of 3m. find the maximum shear stress developed in the section. **(08)**



Q.4 A) A Hollow circular shaft has an external diameter of 120 mm and internal diameter is three-fourth the external diameter, if the stress at a fibre inside is 36 MPa, due to a torque T applied, find this torque, the maximum shear stress and the angle of twist per unit length. G = 85 GPa. **(07)**

OR

A) a shaft of diameter 60 mm is subjected to torques as shown in figure below. Find the maximum shear stress and the angular deformation of D with respect to A. G = 85 GPa. **(07)**



B) for the beam loaded as shown in figure below. Find the slope at point A and deflection at point C. Take E = 2 x 10^5 N/mm^2 and I = 1 x 10^8 mm^4. (Distance CD 2 meter) **(08)**