K. K. Wagh Institute of Engineering Education & Research, Nashik

(An Autonomous Institute From A.Y. 2022-23)

WINTER-2025	
Exam Seat No.:	
Academic Year:2025-2026	Semester:III
Class:SY	Program:B.Tech
Branch Code:CIV	Pattern:2023
Name of Course:Mechanics of Structures	Course Code:2304202
Max. Marks:60	Duration:2.30 Hrs.

Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains 5 pages.
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome.

Marks CO

Question No. 1

1a) A rectangular steel bar is 1m long and 50mm x 30mm in cross-section carries a pull of 93.9kN. Find tensile stress, strain and elongation of bar. Take E = 200GPa. (6) CO1

Question No. 2

2a) Draw SFD and BMD of simply supported beam loaded as shown in figure 2. Also locate the point of contra-shear. (6) CO2

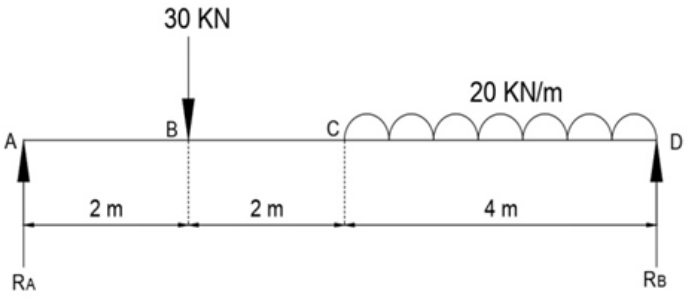

Figure 2

Question No. 3

3a) A simply supported beam 8m span carries udl of 3 kN/m over entire span. Find the maximum bending stress induced for a cross section of beam is as shown in figure 3.a (8) CO3

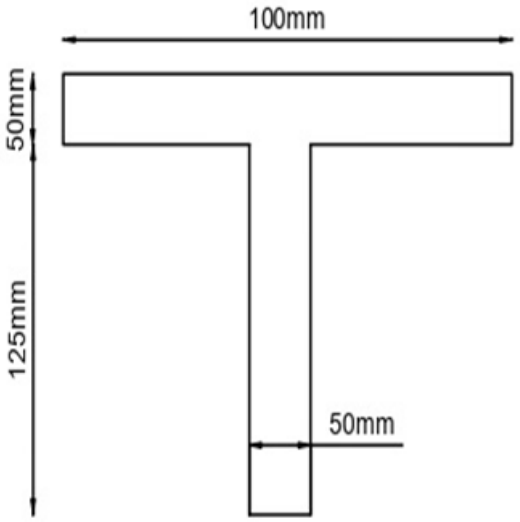

Figure 3.a

OR

3b) A simply supported beam of span 4m carries a maximum bending moment of 30 x 10^6 Nmm. The cross section of beam is as shown in figure 3.b. Find maximum bending stress induced and also draw bending stress distribution diagram. (8) CO3

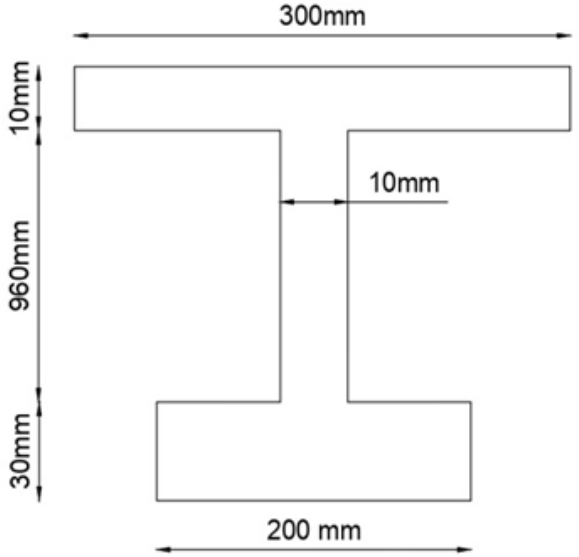

Figure 3.b

3c) A symmetrical beam of I-section is 200mm x 400mm in size. The thickness of flange is 20mm and web is 15mm as shown in figure 3.c. The beam is subjected to a vertical shear force of 80 kN. Draw shear stress distribution diagram over depth of section. (8) CO3

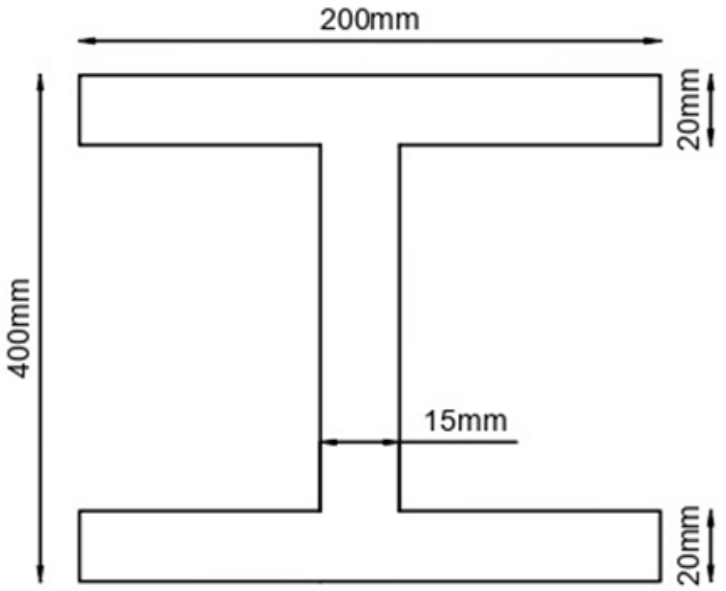

Figure 3.c

OR

3d) Draw shear stress distribution diagram of T- section of beam as shown in figure 3.d. The section is symmetrical at vertical axis and the shear force applied is 110 kN. (8) CO3

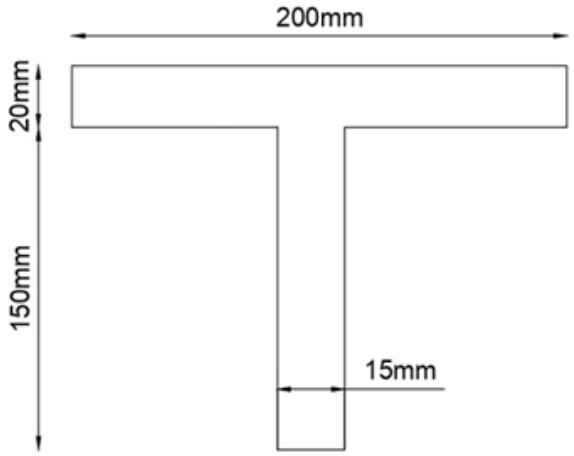

Figure 3.d

Question No. 4

4a) A hollow circular steel shaft has external and internal diameter is 75 mm and 30 mm respectively. While shaft rotates at 120 rpm its angle of twist is observed as 2° in 4m length. Determine power being transmitted. Take G = 77 GPa. (8) CO4

OR

4b) Find the maximum torque that can be applied to a shaft of 60 mm diameter. Also determine the angle of twist in a length of 5 m and permissible shear stress is 60 MPa. Take G = 80 GPa. (8) CO4

4c) If an element is subjected to a state of stress as shown in figure 4.c. Find normal and shear stress on a plane at 30° anticlockwise. Also find maximum sear stress, resultant and obliquity. (8) CO4

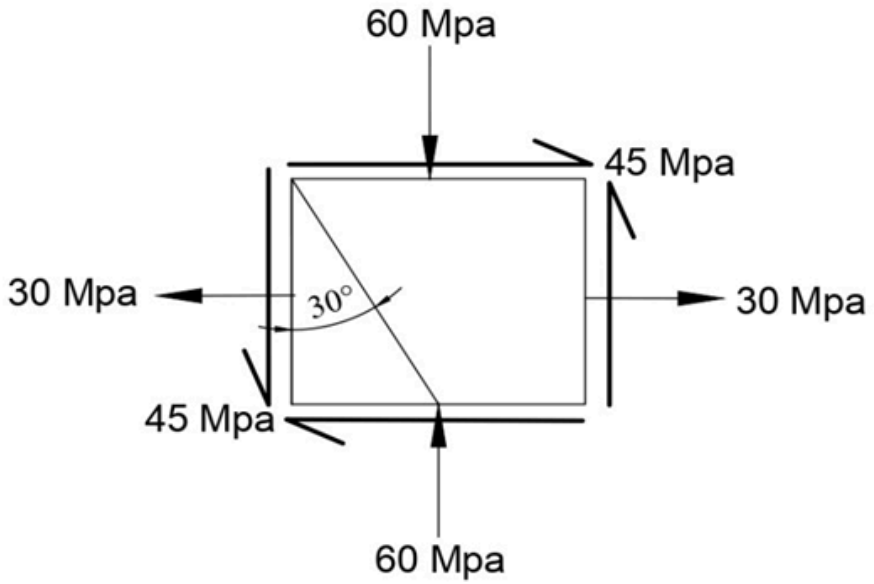

Figure 4.c

OR

4d) At a point in a strained material the value of normal stresses across two right angles to each other are 80 MPa and 32 MPa as shown in figure 4.d. Determine stress components on a plane at 25° anticlockwise. Also find principal stresses and their direction. (8) CO4

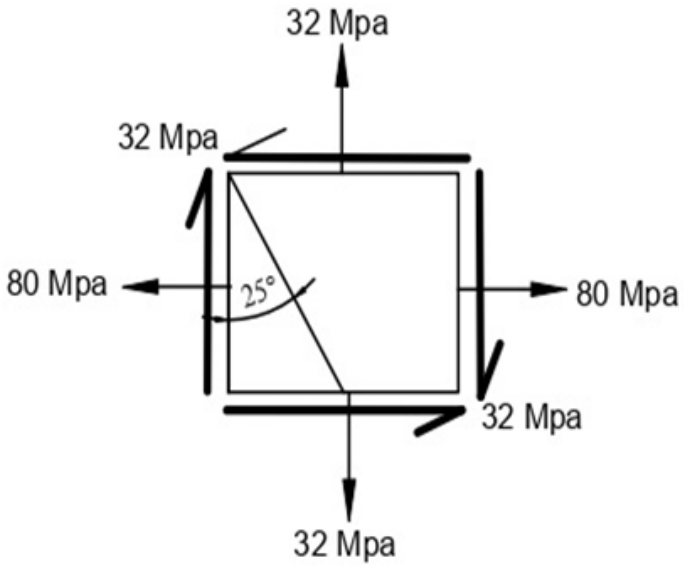

Figure 4.d

Question No. 5

5a) A mild steel tube of 4m long having 30 mm internal diameter and 4 mm thick is used as a strut with both ends are hinged. Find crippling load by Euler's formula and safe load by taking factor of safety as 3. Take E = $2.1x10^5$ MPa. (8) CO5

OR

5b) A hollow column of outside diameter 250mm and has a thickness of 25 mm is 5m long and is fixed at both ends. Calculate safe load by Rankine's formula using factor of safety is 2.5. Take Rankine's constant=1/1600. Maximum stress =550 MPa. (8) CO5

5c) A rectangular column of 150 mm x 120 mm is carrying a compressive load of 180 kN at an eccentricity of 10mm in a plane bisecting thickness. Determine maximum and minimum stresses across the cross-section. (8) CO5

OR

5d) A column supports a load of 500 kN as shown in figure 5.d. Find the stresses at the corners of the column. (8) CO5

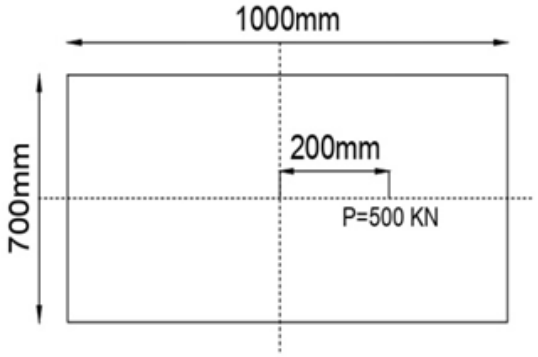

Figure 5.d

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