JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- 2025

MTECH (SE) II SEMESTER

COURSE CODE (CREDITS): 12M1WCE211 (3) MAX. MARKS: 15

COURSE NAME: SOLID MECHANICS IN STRUCTURAL ENGINEERING

COURSE INSTRUCTORS: Dr. Tanmay Gupta MAX. TIME: 1 Hour

Note: *(a) All questions are compulsory.*

(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

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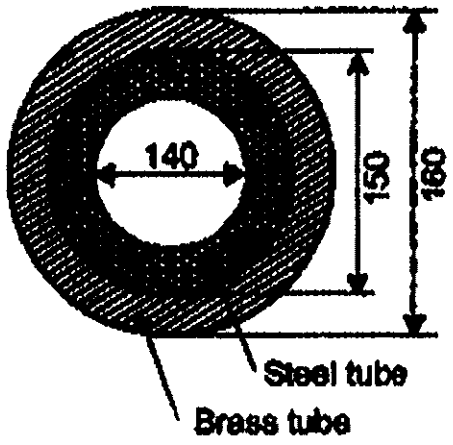
Q.1 At a given point in a material the three-dimensional state of stress is defined as $\sigma_x = \sigma_z = 2$ kPa, $\sigma_y = 3$ kPa. $\tau_{xy} = \tau_{yz} = -1$ kPa, $\tau_{xz} = 1$ kPa. Compute the principal stresses and the principal plane (angles – direction cosine values) for maximum principal stress (σ_1) only. Also show check for invariance. **[5]**

Q.2 With neat diagram explain differential equations of equilibrium in a body with the relevant equations and further derive equilibrium equations for plane stress conditions. **[3]**

Q.3 A compound tube consists of a steel tube of 140 mm internal diameter and 5 mm thickness and an outer brass tube of 150 mm internal diameter and 5 mm thick. The two tubes are of same length. Compound tube carries an axial load of 600 kN. Find the stresses carried by each tube and amount of shortening. Length of the tube is 120 mm. $E_s = 2 \times 10^5$ N/mm^2 and $E_b = 1 \times 10^5$ N/mm^2. **[4]**



Q.4 (a) Explain the difference between hydrostatic stress and deviatoric stress with examples. (b) How do normal and shear stresses change when a material element is rotated? **[3]**