B.Tech. CIVIL ENGINEERING (BTCLEVI)

Term-End Examination

⊓⊓1⊓⊒   **December, 2018**
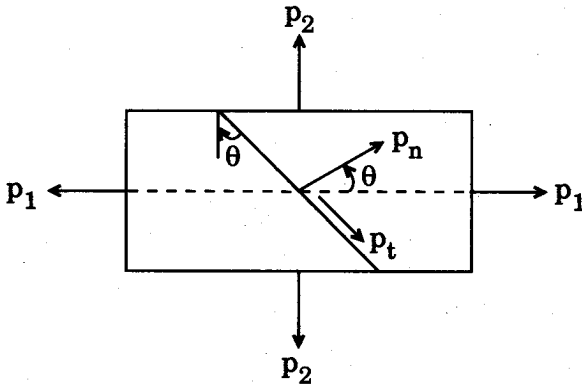
BICE-008 : STRUCTURAL ANALYSIS – I

Time : 3 hours   *Maximum Marks : 70*

Note : *Attempt any **five** questions. Use of scientific calculator in permitted.*

1. (a)   Describe the procedure for construction of Mohr's circle for the stress system shown in Figure 1. Draw the necessary sketches also.   7

Figure 1

(b) A bar of 25 mm diameter is subjected to a pull of 40 kN. Its gauge length is 200 mm, change in length and diameter of the bar due to pull is recorded as 0·085 mm and 0·003 mm respectively. Calculate the Poisson's ratio and the values of the three moduli. 7

2. (a) A railway is laid so that there is no stress in the rails at 10°C. Calculate

(i) the stress in the rails at 50°C if there is no allowance for expansion.

(ii) the expansion allowance if the stress in the rails is to be zero when temperature is 40°. 7

(b) With reference to a stress-strain curve of a material, define the following terms : 7

(i) Yield strength

(ii) Rupture strength

3. **(a)** Find the moment of inertia I_{xx} and I_{yy} for a T-section shown in Figure 2. 7
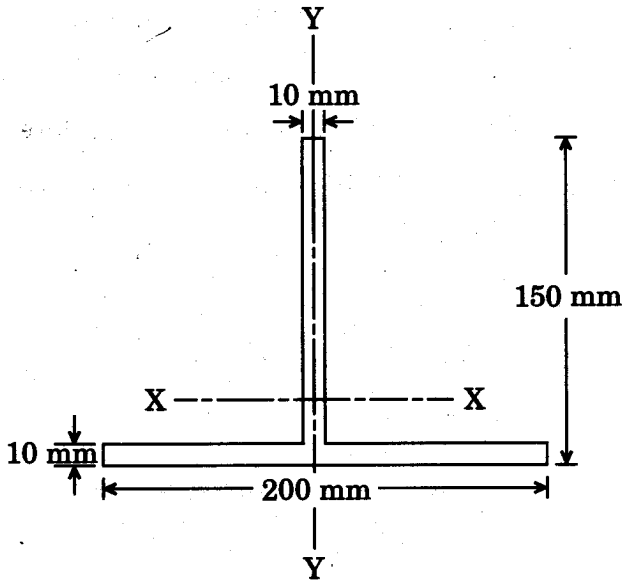

Figure 2

(b) Draw the shear force and bending moment diagrams for the beam shown in Figure 3. 7
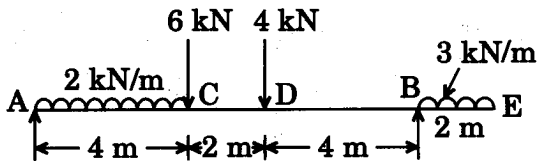

Figure 3

4. **(a)** Discuss the assumptions of Euler's theory. 7

(b)   An I-section joist ISWB 400 which is 8 m long is used as a strut with both ends fixed. Calculate Euler's crippling load. Take $E = 2 \times 10^5$ N/mm^2 and for the given section $I_{xx} = 23426 \cdot 7$ cm^4, $I_{yy} = 1388 \cdot 0$ cm^4.   7

5. (a)   What is shear centre ? Determine the shear centre for the channel section shown in Figure 4.   7
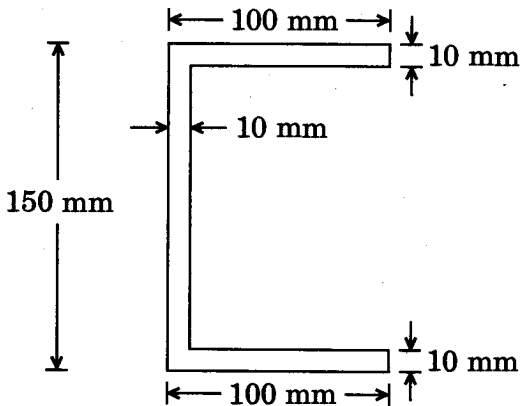

Figure 4

(b)   Find the torque which a shaft of 200 mm diameter can safely transmit if the shear stress is not to exceed 50 N/mm^2.   7

6. What is non-destructive testing ? Enlist various methods of non-destructive testing. Discuss any one method in detail. *14*

7. Write short notes on any *four* of the following : $4 \times 3\frac{1}{2} = 14$

(a) Principle of Superposition

(b) Parallel Axis Theorem

(c) Proof Stress

(d) Hooke's Law

(e) Middle Third Rule

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