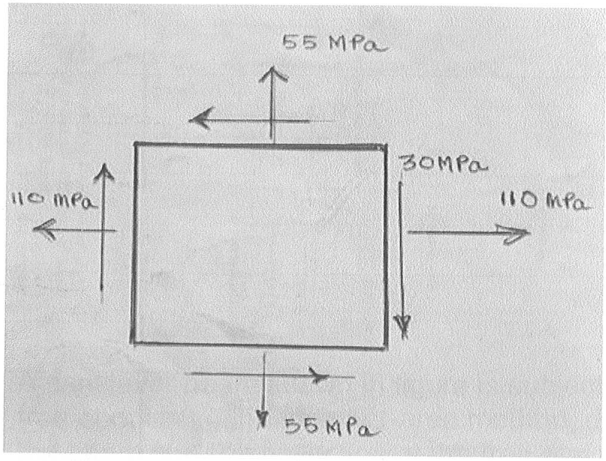
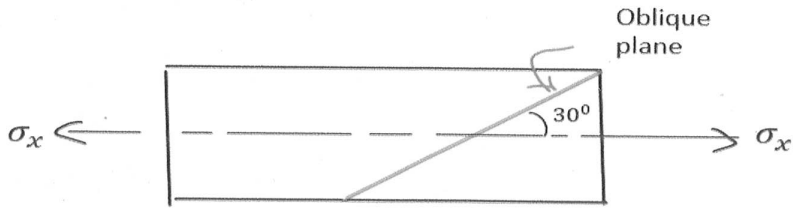
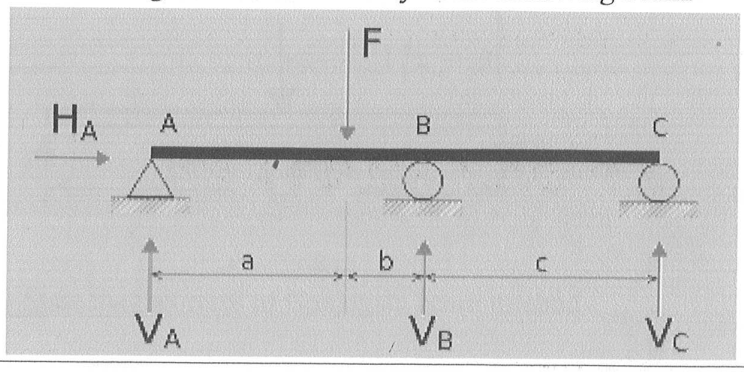
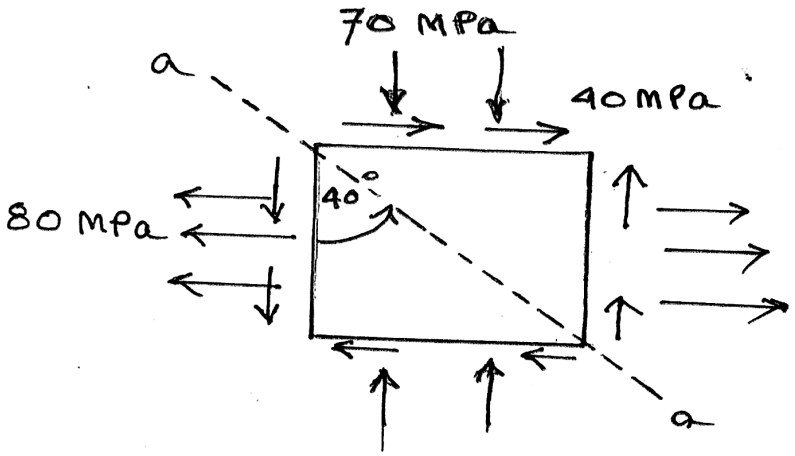
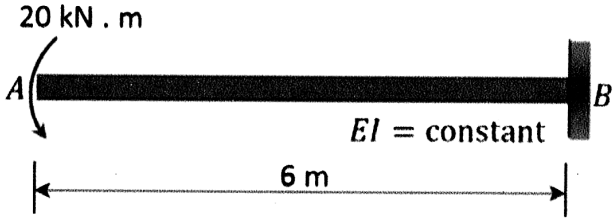
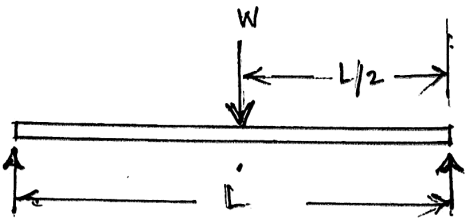
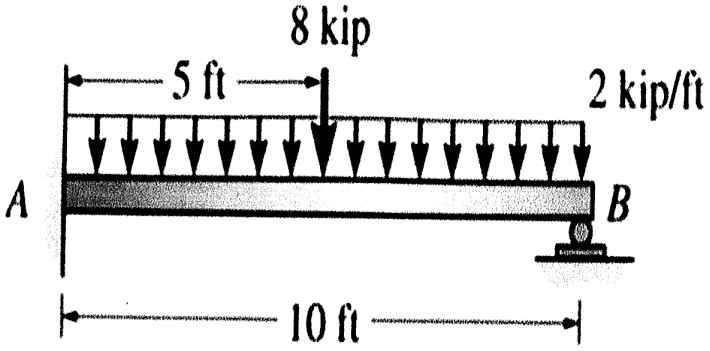
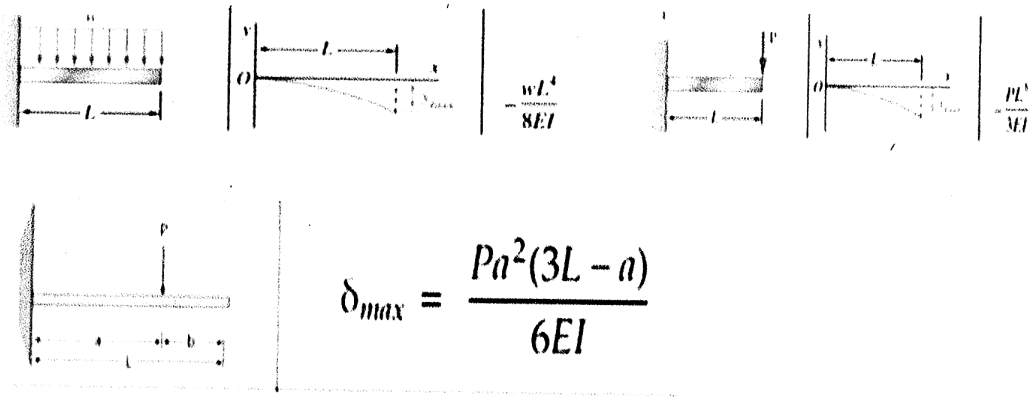
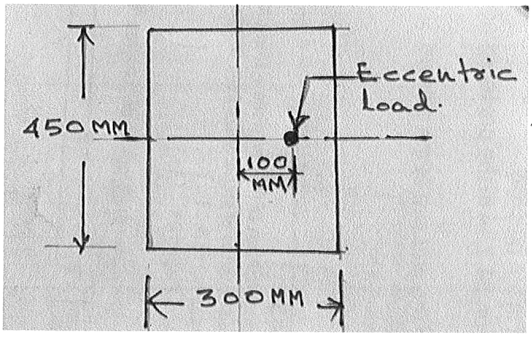
Bachelor of Architecture
Second Year First Semester Supplementary- 2024
Subject: Theory of Structures-I

TIME: 3 HRS **Answer any Five** **Full Marks: 100**

No. of Qs	1) Illustrate your answers with neat sketches wherever necessary. 2) All notations represent their standard relevant meaning. 3) Assume suitable data, if necessary.	Marks
1.a)	The state of stress on member is shown . Find the maximum and minimum amount of principal stress. 	6
b)	A tension member is subjected to an axial stress of 20 N/mm and the plane of oblique is 30 to the axis of stress. Compute the normal and shear stress on oblique plane. 	8
c)	State the degree of indeterminacy of the following beam. 	6

No. of Qs		Marks
2 a)	Using Mohr's circle determine and show on a sketch a. Principal stresses b. τ_{max} c. σ_n and τ_n on plane a-a 	10
b)	A cantilever beam shown in figure is subjected to a concentrated moment at its free end. Using the moment-area method, determine the slope at the free end of the beam and the deflection at the free end of the beam. EI = constant. 	10
3a)	Mention the theorems of Moment Area method for calculating deflection.	5
b)	Figure shows a simply supported beam AB of length L carrying a point load W at the Centre, Find the slope at supports and deflection at mid-point using conjugate beam method. EI = constant 	10
c)	State the theorems of Conjugate beam method	5

No. of Qs		Marks
4 a)	Applying the Principle of super position, determine the reaction at the roller support B of the beam shown. EI is constant. (1 kip = 1000 pounds of force)  [Provided: loading and associated deflection of cantilever beam as shown]  	12
b)	State the assumptions made while analyzing deflection and slope of a beam using Principle of Super position.	6
c)	State the common methods for analyzing the deflection of beam.	2
5a)	What is meant by effective length of a column? Give the relationship between the effective length and actual length of the column for various end conditions.	6
b)	Mention the assumptions made in Euler's Column Theory.	6
c)	Find the ratio of Euler's buckling loads of column with the same parameters having (i) both ends fixed, and (ii) both ends hinged	4
d)	Differentiate between Buckling load and Crushing load .	4

No. of Qs		Marks
6 a)	Define "Eccentric load" .	4
b)	A strut 2.50 meters long is having 6 cm. diameter. One end of the strut is fixed while its other end is hinged. Find the safe compressive load for the member using Euler's formula, allowing a factor of safety of 3.5. Take $E = 2.1 \times 10^6 \text{ kg/cm}^2$	8
c)	Find out the maximum and minimum resultant stresses for a rectangular column of size 300 x 450 mm carrying an eccentric load of 800 KN along the 300 mm width at 100 mm from centroid axis . 	8