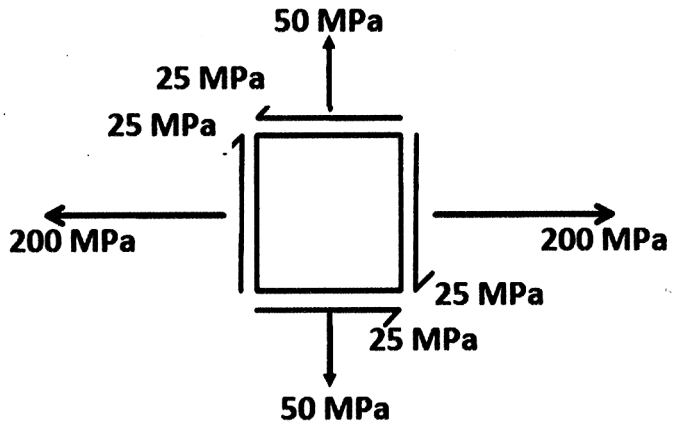
Ref. No. : Ex/Arch/CE/T/215/2023(S)

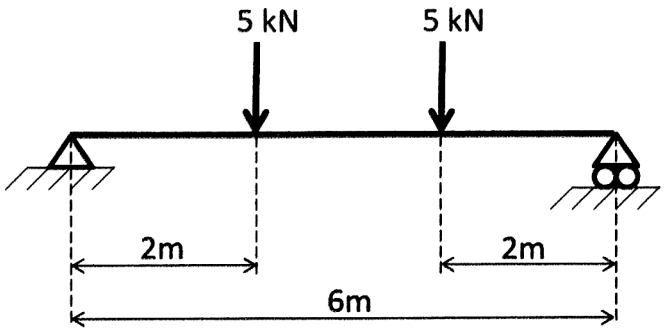
Name of the Examinations: BACHELOR OF ARCHITECTURE SECOND YEAR FIRST SEMESTER SUPPLEMENTARY EXAM 2023
Subject : THEORY OF STRUCTURES I

Time: 3 Hours Full Marks: 100

Instructions:	
I	All notations represent their standard relevant meaning.
II	If you feel that any data or condition is/are missing in any question, please assume relevant inputs and mention the same.

Sl No	**Question**	**Marks**
1	**(a)** How angle of obliquity can be determined for a stress block? (5 marks) **(b)** Consider the stress block from Figure: 01 and find out the amount of Principle Stresses using Analytical Method. (8 marks) **(c)** Locate Principle plane and mention its position from any face and mention the face of reference using analytical approach. (6 marks) **(d)** Find out amount of maximum shear stress in the stress block using analytical method. (6 marks)  Figure: 01 (Not to Scale)	25
2	Consider a prismatic cantilever beam of length 4m of solid rectangular cross section (Breadth 100mm and depth 200mm) subjected to concentrated load of **10 kN** at 2m inside the beam from the free end. Young's Modulus, $E=2x10^5$ N/mm^2 (a) Draw the shear stress distribution diagram for the section with maximum shear force of the beam (11 marks). (b) Draw the bending stress distribution diagram for the section with maximum bending moment of the beam (14 marks).	25

[Turn over

3	 Figure: 02 (Not to Scale) Consider the beam of uniform cross section from Figure: 02 that has rectangular solid cross section (Breadth 80mm and depth 100mm). Consider Young's Modulus, $E=2x10^5 N/mm^2$ Using moment area method, find out slope (in radian) and deflection (in mm) of the beam at supports and mid-point of the beam.	25
5	Consider a 5m long column made of certain grade of steel (for which, Young's Modulus, $E=2x10^5$ N/mm^2) whose both ends are hinged. The column is having uniform solid rectangular cross section of 300mm x 400mm . **(a)**Determine Euler's buckling load (10 marks) **(b)** Considering factor of safety 2, determine safe buckling load. (2 marks) **(c)**If the cross section is changed from rectangular to circular keeping the amount of cross sectional area and all other parameters unchanged, determine the percentage change of Euler's buckling load. (8 marks) **(d)**Write a short note on the effect of effective length of column on column buckling. (5 marks)	25