CLASS: B.ARCH   SEMESTER : III
BRANCH: ARCHITECTURE   SESSION : MO/2023

SUBJECT: AR204 STRUCTURAL MECHANICS

TIME: 02 Hours   FULL MARKS: 25

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates

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			CO	BL
Q.1(a)	Explain bi-axial state of stress at a point of the body with an example.	[2]	1	2
Q.1(b)	At a particular point, the material has biaxial state of stress with σ_x = 14 MPa and σ_y = -56 MPa. Determine the orientation of an inclined plane through the point such that the normal stress on the plane is zero.	[3]	1	3

			CO	BL
Q.2(a)	Define the terms: Principal planes and principal stresses.	[2]	1	1
Q.2(b)	An element of material in plane strain undergoes the following strains:	[3]	1	3

$$\epsilon_x = 340 \times 10^{-6}; \; \epsilon_y = 110 \times 10^{-6}; \; \gamma_{xy} = 180 \times 10^{-6}$$

Determine the following quantities:
(a) the strains for an element oriented at an angle θ = 30°, (b) the principal strains, and (c) the maximum shear strains.

			CO	BL
Q.3(a)	Describe briefly about 45° and 60° strain rosette.	[2]	1	1
Q.3(b)	During a test of an airplane wing, the strain gage readings from a 45° rosette (Figure 1) are as follows: gage A, **520** $\times 10^{-6}$; gage B, **360** $\times 10^{-6}$; and gage C, **–80** $\times 10^{-6}$. Determine the principal strains and maximum shear strains.	[3]	1	3

Figure 1

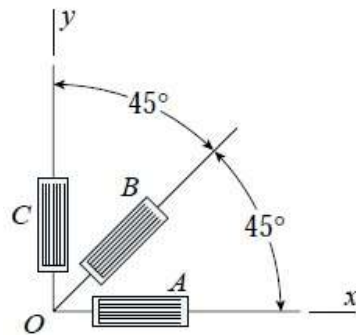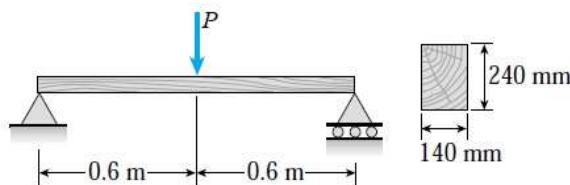|			CO	BL
Q.4(a)	Explain pure bending of beams with a suitable example.	[2]	1,2	2
Q.4(b)	Define and explain section modulus of a beam with the help of a suitable example.	[3]	1,2	1,2
Q.5	A simply supported wood beam of rectangular cross section and span length 1.2 m carries a concentrated load P at mid span as shown in Figure 2. The cross section has width 140 mm and height 240 mm. Calculate the maximum permissible value of the load P If the allowable bending stress is 8.5 MPa.	[5]	1,2	3

Figure 2

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