BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION MO/2024)

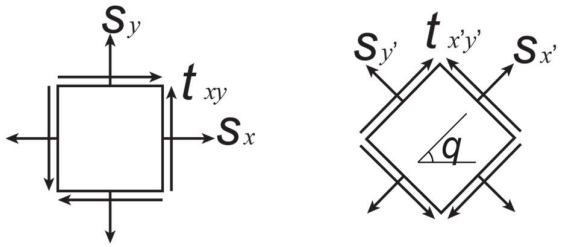
CLASS: BTECH. **SEMESTER : III/ADD**
BRANCH: MECHANICAL/PIE **SESSION : MO/2024**

SUBJECT: ME205 STRENGTH OF MATERIALS

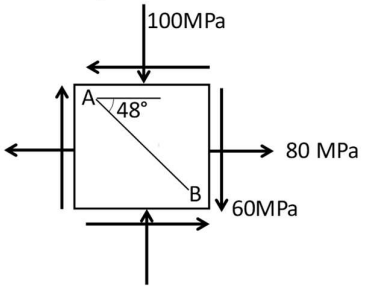
TIME: 02 Hours **FULL MARKS: 25**

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**

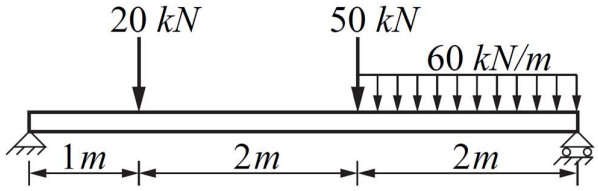
			CO	BL
Q.1	At a point on the surface of a machine part, the state of stress on two elements inclined at an angle θ to each other are shown in figure. Prove that $\sigma_x + \sigma_y = \sigma_{x'} + \sigma_{y'}$.	[5]	1	3



Q.2	For the stress element shown in figure, Find normal and shear stresses on plane AB.	[5]	1, 3	4



Q.3	At a point on the surface of an alloy steel (E = 210 GPa and ν = 0.30) machine part subjected to a biaxial state of stress, the measured strains were $\varepsilon_x = +1394 \times 10^{-6}$, $\varepsilon_y = -660 \times 10^{-6}$, and $\tau_{xy} = +2054 \times 10^{-6}$. Determine the principal stresses and the maximum shear stress at the point.	[5]	1, 3	4
Q.4	Derive the expression for bending stress in a beam.	[5]	2	3
Q.5	Find the support reactions and draw the shear force and bending moment diagrams for a beam as shown in figure.	[5]	2	4



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