BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

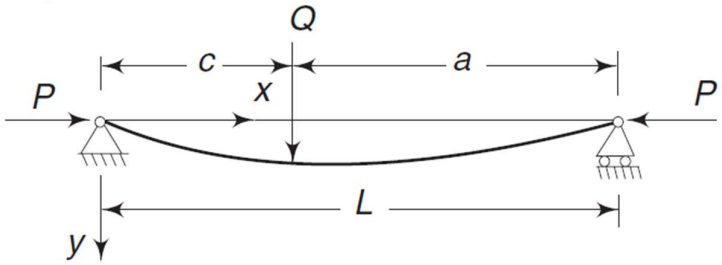
CLASS: B.TECH. **SEMESTER : VI**
BRANCH: MECHANICAL **SESSION : SP/2023**

SUBJECT: ME355 ADVANCED SOLID MECHANICS

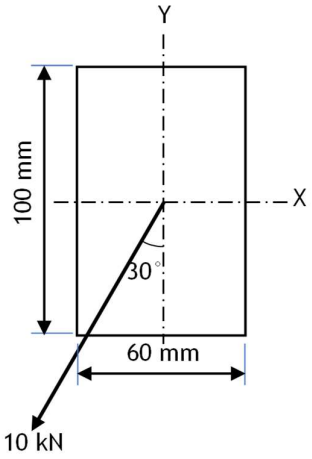
TIME: 3 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	Define stress at a point.	[5]	1	2
Q.1(b)	Find the value of principal stresses if the stress components at a point are $\sigma_x = \sigma_y = \sigma_z = 1\ MPa, \tau_{xy} = 2\ MPa, \tau_{yz} = \tau_{zx} = 1\ MPa.$	[5]	1	3
Q.2	Find the equation for deflection of a beam-column subjected to a concentrated load as shown in Figure.	[10]	2	3



Q.3	A rectangular-section beam 100 mm x 60 mm is arranged as a cantilever 1.5 m long and loaded at its free end with a load of 10 kN inclined at an angle of 30° to the vertical as shown in Figure. Determine the position and magnitude of the greatest tensile stress in the section. What will be the vertical deflection at the end? E = 210 GN/m^2.	[10]	3	4



Q.4	For the torsion of a general prismatic bar of solid section, show that the warping function ψ(x,y) satisfies the Laplace Equation $\nabla^2\psi = 0$.	[10]	4	4
Q.5(a)	What are thermoelastic stress-strain relations?	[5]	5	2
Q.5(b)	The inner surface of a hollow tube is at temperature T_i and the outer surface at zero temperature. Assuming steady-state conditions, calculate the stresses. What are the values of σ_θ and σ_z near the inner and outer surfaces?	[5]	5	4

::::::03/05/2023::::::M