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UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2019

Course: Theory of Elasticity& Plasticity **Semester: I**
Program: M.Tech. Structural Engineering **Time 03 hrs.**
Course Code: CIVL 7002 **Max. Marks: 100**

Instructions: Answer all questions of Section A, B & C
(Assume all the necessary data if necessary) (Internal Choice is there in Q 5-SectionB and Q 6-Section C)

SECTION A

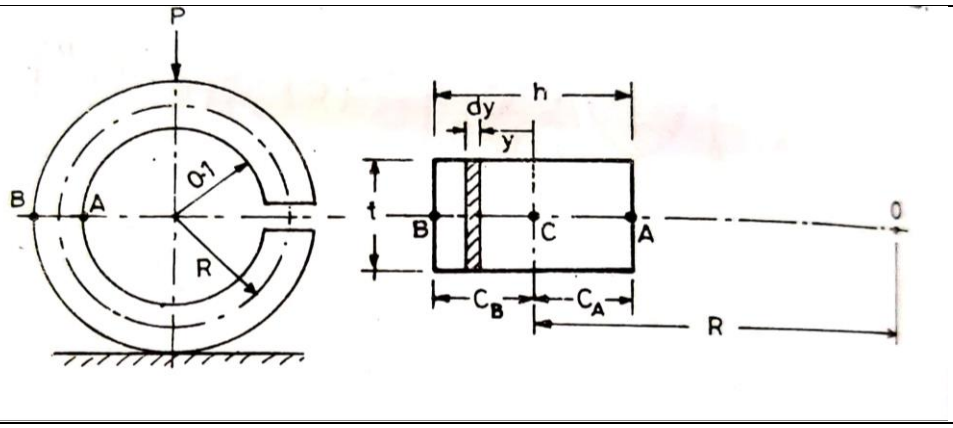
S. No.		Marks	CO
Q 1	Prove the following Airy's stress functions and examine the stress distribution represented by them: a) $\Phi = Ax^2 + By^2$ b) $\Phi = Ax^3$ c) $\Phi = A(x^4 - 3x^2y^2)$ d) $\Phi = A(x^3 - 3x^2y^2)$ e) $\Phi = Ax^2y^2$	**4** **4** **4** **4** **4**	**CO2**

SECTION B

Q 2	The stress components at a point are given by the following array: $\begin{bmatrix} 10 & 5 & 6 \\ 5 & 8 & 10 \\ 6 & 10 & 6 \end{bmatrix} MPa$ Calculate the Principal Stresses and Principal Planes.	**10**	**CO1**
Q 3	Using Polynomials, calculate the bending of cantilever beam loaded at the end.	**10**	**CO2**
Q 4	Develop Constitutive matrix for Tetragonal material. Using direction cosine matrix, Stress matrix, obtain number of elastic constants.	**10**	**CO1**
Q 5	Define different hardening rules for materials in case of plastic state. Or Obtain yield criteria of metals graphically in case of plastic state.	**10**	**CO4**

SECTION-C

Q 6	An elliptical shaft of semi axis a = 0.05m, b = 0.025m, and G = 80 GPa is subjected to a twisting moment of 1200 Π N m. Determine the maximum shearing stress and the angle of twist per unit length. Or Calculate torsional rigidity for elliptical section using stress function approach.	**20**	**CO3**
Q 7	A load P = 70 kN is applied to the circular steel frame shown in the figure. The rectangular cross section is 0.1m wide and 0.05m thick. Determine the tangential stress at point A and B	**20**	**CO3**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