## PG CBCS M.SC. Semester-II Examination, 2021 (MATHEMATICS) PAPER: MTM-205

(GENERAL THOERY OF CONTINUUM MECHANICS)

## Full Marks: 40

## **Time: 2 Hours**

Α	nswer any <u>FOUR</u> questions from the following:	4×10=40
1.	Define Perfect fluid. Derive the energy equation for Perfect fluid	d.
		2+8
2.	Define Stress quadratic. Derive the Cauchy's second equation of	f motion.
		3+7
3.	Discuss the volumetric strain for small deformation of a body	. Establish
	the stress vector and stress tensor relationship.	4+6
4.	State and prove Kelvin's Minimum Energy theorem. What is vo	ortex line?
		8+2
5.	(a) Show the equivalence between Eulerian and Lagrangian	forms of
	equations of continuity.	
	(b) Define principal stress and principal direction of stress. Pro-	ove that all
	principal stresses are real.	5+5
6.	Establish the relation between Lame's constants $\mu$ and $\lambda$ and e	ngineering
	constants E, v and K.	10
7.	(a) Derive the condition for a given surface $F(x_1, x_2, x_3, t) =$	0 to be a
	boundary surface of a fluid motion.	
	(b) Give examples of rotational and irrotational fluid flows.	7+3
8.	(a) Show that the stress potential or strain-energy fu	inction is
	homogeneous function of second degree.	
	(b) Given strain field	
	$\begin{pmatrix} K_1 X_2 & 0 & 0 \end{pmatrix}$	
	$(E_{ij}) = \left(\begin{array}{ccc} 0 & -K_2 X_2 & 0 \\ 0 & 0 & K_2 Y_2 \end{array}\right)$	
	$\vee 0 \qquad 0 \qquad -K_2X_2/$	

What should be the relation between  $K_1$  and  $K_2$  such that there will be no volume change. 8+2