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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SECOND SEMESTER M.TECH DEGREE EXAMINATION, APRIL 2019

(Mechanical Engineering)

(Thermal Engineering)

03ME 6032 Continuum Mechanics of Fluids

Max. Marks: 60

Time: 3Hrs

PART-A (5 x 4 =20Marks)

1. With examples, define covariant and contravariant components of a vector.
2. Obtain the expression for Almansi strain tensor.
3. Define the inverse of a second order tensor. Give the properties of inverse.
4. State the principle of material frame indifference.

PART B (10 x 4 =40 marks)

5. (a). Find $(a_1 \times a_2) \cdot (a_3 \times a_4)$ where, $a_1 = (9,8,4)$, $a_2 = (7,1,3)$, $a_3 = (5,3,6)$ and $a_4 = (2,3,-1)$. (5)
(b). If $g_1 \sim (1,-1,2)$, $g_2 \sim (0,1,1)$ and $g_3 \sim (-1,-2,1)$ are the base vectors, find the reciprocal base vectors. (5)

OR

6. (a). Define a second order Tensor. Write down the Cartesian components of a second order tensor. (5)
(b) Explain the term Kronecker Delta. (5)
7. (a). Define the term deformation gradient. Write down its components. (5)
(b). Obtain the expressions for right and left Cauchy—Green strain tensors. (5)

OR

8. (a). With an example, explain the term velocity gradient. (5)
(b). Explain the material and spatial description of a velocity field. (5)
9. State and prove Cayley Hamilton theorem. (10)

OR

10. State and prove polar decomposition theorem. (10)
11. (a). Write down the constitutive relations for isotropic materials. (5)
(b). Obtain the relation between thermodynamic pressure and mean pressure. (5)

OR

12. (a). Write down the constitutive response relations based on material symmetry. (5)
(b). State and explain the principle of local action. (5)
