Question Bank For PG Course

Mathematics

Paper-5B

ELEMENTS OF CONTINUUM MECHANICS & SPECIAL THEORY OF RELATIVITY : PGMT-VB

Question 1

What is the fundamental postulate of the theory of relativity?

Question 2

A particle with a mean proper lifetime of 10^{-6} sec, moves through the laboratory at 2.7×10^{10} cm/sec. What is its lifetime, as measured by the observer in the laboratory?

Question 3

In the measure of finite strain in Lagrangian method, if the length of line element are dL and dl before and after deformation respectively, then $dl^2 - dL^2 = 2r_{kl}dX_k dX_l$, then what is the expression of r_{kl} ?

Question 4

The strain tensor at a point is given by $E_{ij} = \begin{pmatrix} a & b & 0 \\ b & -a & 0 \\ 0 & 0 & 0 \end{pmatrix}$, then what are the principal strains?

Question 5

What are the nature of principal strains?

Question 6

What is the direction of the three principal strains, if the principal strains are distinct?

Question 7

What is the equation of continuity in Lagrangian method?

Question 8

Which principle is used to establish the symmetry of stress tensor?

Question 9

What is the principal stress?

Question 10

The principal stress at a point are $T_1 = 1, T_2 = -1, T_3 = 3$, If the stress a a point is given by $T_{ij} = \begin{pmatrix} T_{11} & 0 & 0 \\ 0 & 1 & 2 \\ 0 & 2 & T_{33} \end{pmatrix}$. What are the values of T_{11} and T_{33}?

Question 11

What is the stress strain relation for an isotropic elasticbody?

Question 12

What is the expression of Poisson's ratio in elasticity theory?

Question 13

What is the constitutive equation of a perfect fluid?

Question 14

For the velocity field given by $v_1 = kx_3, v_2 = kx_3, v_3 = k(x_1 + x_2)$. What is the behaviour of the motion of the fluid?

Question 15

For the velocity field $v_1 = \frac{ax_1}{1+t}, v_2 = \frac{2ax_2}{1+t}, v_3 = \frac{3ax_3}{1+t}$. What are the streamlines?

Question 16

If the axes of two inertial frames are parallel and the origins of these frame coincide at $t = t' = 0$, then what is the Lorentz transformation between these frames?

Question 17

Two particles come toward each other, each with speed 0.9c with respect to the laboratory. What is the relative speed?

Question 18

In the measure of finite strain in Eulerian method, if the length of line element are dL and dl before and after deformation respectively, then $dl^2 - dL^2 = 2\eta_{kl} dX_k dX_l$, then what is the expression of r_{kl} ?

Question 19

The strain tensor at a point is given by $E_{ij} = \begin{pmatrix} 1 & 3 & -2 \\ 3 & 1 & -2 \\ -2 & -2 & 6 \end{pmatrix}$, then what are the principal strains?

Question 20

What is called the change in volume per unit original volume?

Question 21

What is the principal direction of strain?

Question 22

What is the equation of continuity in Eulerian method?

Question 23

Which principle is used to derive the equation of motion?

Question 24

What is the behaviour of infinitesimal strain tensors in the Lagrangian method and Eulerian method?

Question 25

The stress tensor at a point is given by $T_{ij} = \begin{pmatrix} 3 & 1 & 1 \\ 1 & 0 & 2 \\ 1 & 2 & 0 \end{pmatrix}$. What are principal stresses?

Question 26

Are the principal directions of strain at each point of a linearly elastic isotropic body are coincident with the principal directions of stress?

Question 27

What is the ratio of the hydrostatic stress to decrease in volume per unit volume called?

Question 28

What is the constitutive equation for isotropic homogeneous linearly viscous compressible fluid?

Question 29

What is expression for rate of the circulation Γ round a closed circuit C in a moving viscous fluid with velocity $\vec{v} = (v_1, v_2, v_3)$?

Question 30

For the velocity field $v_1 = Kx_3, v_2 = Kx_3, v_3 = K(x_1 + x_2)$. What are the streamlines?