BRAINWARE UNIVERSITY

Term End Examination 2021 - 22
Programme – Master of Science in Mathematics
Course Name – Continuum Mechanics
Course Code - MSCMC204
(Semester II)

Time allotted : 1 Hrs.15 Min.   **Full Marks : 60**

[The figure in the margin indicates full marks.]

Group-A

(Multiple Choice Type Question)   1 x 60=60

Choose the correct alternative from the following :

(1) A body continues in its state of rest or uniform motion, unless no external force is applied to it

  a) Law of inertia   b) Law of force

  c) Law of action and reaction   d) None of these

(2) The time rate of change of momentum is proportional to impressed force

  a) inertia   b) force

  c) action and reaction   d) none

(3) The following $I_{zz} = \sum_{i=1}^{n} m_i \left(x_i^2 + y_i^2 \right)$ represents

  a) Moment of inertia about X-axis   b) Moment of inertia about Y-axis

  c) Moment of inertia about Z-axis   d) None of these

(4) A rigid body moving freely in space has degrees of freedom

  a) 3   b) 6

  c) 9   d) 0

(5) The angle of inclination of the plane at which the body begins to move down the plane, is called

  a) Angle of friction   b) Angle of repose

  c) Angle of projection   d) None of these

(6) Pick up wrong statement about friction force for dry surfaces. Friction force is

 a) Proportional to normal load between the surfaces   b) Dependent on the materials of contact surface

c) Proportional to velocity of sliding   d) Independent of the area of contact surfaces

(7) The term 'Centroid' is

a) The same as centre of gravity   b) The point of suspension

c) The point of application of the resultant of all the forces tending to cause a body to rotate about a certain axis

d) None of these

(8)
If the masses of both the bodies, as shown in the below figure, are reduced to 50 percent, then tension in the string will be
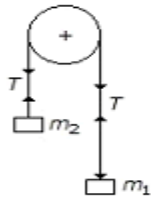
a) same   b) half

c) double   d) None of these

(9) Forces are called coplanar when all of them acting on body lie in

a) One point   b) One plane

c) Different planes   d) Perpendicular planes

(10) The coefficient of friction depends upon

a) Nature of surfaces   b) Area of contact

c) Shape of the surfaces   d) None of these

(11) A machine having an efficiency greater than 50%, is known as

a) Reversible machine   b) Non-reversible machine

c) Neither reversible nor non-reversible machine

d) Ideal machine

(12) Coulomb friction is the friction between

a) Bodies having relative motion   b) Two dry surfaces

c) Two lubricated surfaces   d) Solids and liquids

(13) The Cartesian equation of trajectory is (where u = Velocity of projection, α = Angle of projection, and x, y = Co-ordinates of any point on the trajectory after t seconds.)

a) $y = (gx^2/2u^2 \cos^2\alpha) + x. \tan\alpha$

b) $y = (gx^2/2u^2 \cos^2\alpha) - x. \tan\alpha$

c) $y = x. \tan\alpha - (gx^2/2u^2 \cos^2\alpha)$

d) $y = x. \tan\alpha + (gx^2/2u^2 \cos^2\alpha)$

(14) A force acting on a body may

a) Change its motion   b) Balance the other forces acting on it

c) Retard its motion

d) Change its motion, Balance the other forces acting on it & Retard its motion

(15) The energy possessed by a body, for doing work by virtue of its position, is called

a) Potential energy   b) Kinetic energy

c) Electrical energy   d) Chemical energy

(16) The necessary condition for forces to be in equilibrium is that these should be

a) Coplanar
b) Meet at one point
c) Coplanar and Meet at one point
d) None of these

(17) Which of the following is a vector quantity?

a) Energy
b) mass
c) momentum
d) angle

(18) Mohr' s circle is a graphical method to find

a) Bending stresses
b) Principal stresses
c) Torsional shear stresses
d) None

(19) When does Mohr's stress circle method fail

a) the given two normal stresses are of the same magnitude and same nature
b) the given two normal stresses are of the same magnitude and are of opposite nature
c) the given two normal stresses are of the unequal magnitude and same nature
d) None

(20) The ordinate of the Mohr's circle is a

a) Shear stress
b) Normal stress
c) Normal as well as shear stress
d) None

(21) The principal strain due to $\sigma 1$ (compressive) and $\sigma 2$ (tensile) stress will be

a) $(1/E)(-\sigma 1 + \sigma 2)$
b) $(1/E)(-\sigma 1 + \mu \sigma 2)$
c) $(1/E)(- \sigma 1 - \mu \sigma 2)$
d) None of these

(22) The relation between the elastic constant is

a) $E = 3 KG /(3K + G)$
b) $E = 6 KG / (3K + G)$
c) $E = 9GK /(3K + G)$
d) None

(23) Resilience under principal tensile stresses $\sigma 1$ and $\sigma 2$ is

a) $(1/2E)(\sigma 12 + \sigma 22 - 3\mu \sigma 1 \sigma 2)$
b) $(1/2E)(\sigma 12 + \sigma 22 - 4\mu \sigma 1 \sigma 2)$
c) $(1/2E)(\sigma 12 + \sigma 22 - 5\mu \sigma 1 \sigma 2)$
d) None of these

(24) Which of these fluids have their stress tensor linearly varying to the strain rate?

a)

b)
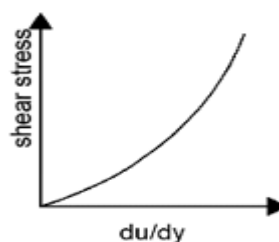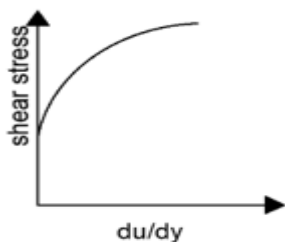
c)
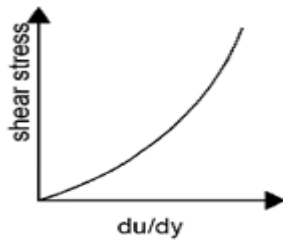
d)
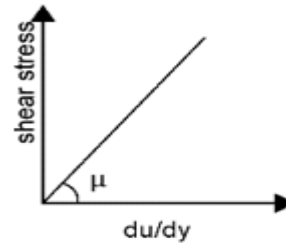
(25) Which of the stress tensors from the diagram is represented by τ_{xy}?
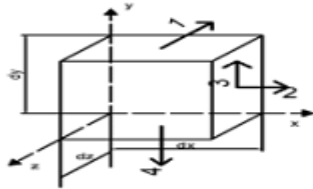
a) 3

b) 2

c) 1

d) 4

(26) What are the two viscosity coefficients involved in the relationship between stress tensor and strain rate of fluids?

a) Kinematic viscosity and bulk viscosity

b) Dynamic viscosity and kinematic viscosity

c) Dynamic viscosity and bulk viscosity

d) Kinematic viscosity and volume viscosity

(27) Express the shear stress tensor(τ) of a three-dimensional fluid flow element in terms of the velocity vector(v).

a) $\tau=\mu(\nabla\vec{v})T+\lambda(\nabla.\vec{v})I$

b) $\tau=\mu(\nabla\vec{v})+\lambda(\nabla.\vec{v})I$

c) $\tau=\mu(\nabla\vec{v})T+(\nabla.\vec{v})T$

d) $\tau=\mu(\nabla\vec{v})T+(\nabla.\vec{v})T+\lambda(\nabla.\vec{v})I$

(28) Viscous forces fall into which kind of the following forces acting on a body?

a) Pressure force

b) Tensile force

c) Body forces

d) Surface forces

(29) What is the stress-strain curve?

a) It is the percentage of stress and stain

b) It is the relationship between stress and strain

c) It is the difference between stress and strain

d) None of the mentioned

(30) Which point on the stress strain curve occurs after the lower yield point?

a) Yield plateau

b) Upper yield point

c) Ultimate point

d) None of the mentioned

(31) Which point on the stress strain curve occurs after the ultimate point?

a) Last point

b) Breaking point

c) Elastic limit

d) Material limit

(32) According to equation of continuity, when water falls its speed increases, while its cross sectional area

a) increases
b) decreases
c) remain same
d) different

(33) Venturi relation is one of applications of

a) equation of continuity
b) Bernoulli's equation
c) light equation
d) speed equation

(34) A fluid whose viscosity does not change with the rate of deformation or shear strain is known as

a) Real fluid
b) Ideal fluid
c) Newtonian fluid
d) Non-Newtonian fluid

(35) A flow whose streamline is represented by a curve, is called

a) One-dimensional flow
b) Two-dimensional flow
c) Three-dimensional flow
d) Four-dimensional flow

(36) The flow of water through the hole in the bottom of a wash basin is an example of

a) Steady flow
b) Uniform flow
c) Free vortex
d) Forced vortex

(37) Euler's number is the ratio of _____ force to pressure force.

a) Inertia
b) Gravity
c) Viscous
d) None of these

(38) The locus of all points at which the Joule-Kelvin coefficient is _____ is the inversion curve.

a) negative
b) positive
c) zero
d) infinity

(39) The viscous force the relative motion between the adjacent layers of a fluid in motion.

Which one of the flowing fits best in the sentence?

a) opposes
b) never affects
c) facilitates
d) may effect under certain conditions

(40) Navier- Stokes equation describes the motion of _____

a) Solid substance
b) Non-viscous fluid
c) Viscous fluid
d) Gas

(41) Continuum mechanics is a branch of mechanics that deals with_____

a) Fluid particles
b) Discrete particles
c) Kinematics and mechanical behaviour
d) Hydrostatic Pressure

(42) The Navier- Stokes equation can be used in which of the following applications?

a) Automobiles

b) Ocean Currents

c) Airplanes

d) Thermometer

(43) What is the velocity profile for Poiseuille flow?

a) Zero

b) Constant

c) Linear

d) Quadratic

(44) What are the Newtonian constitutive assumptions regarding relationship between stress tensor and velocity gradients?

a) Linear and isotropic

b) Constant

c) Linear

d) Non-Uniform

(45) The velocity profile of the Couette flow is _____

a) Quadratic

b) Constant

c) Linear

d) Zero

(46) What are the dependent variables in the Navier-Stokes equations?

a) τ, T, p, ρ

b) p, ρ, T

c) u, v, w, T, p, ρ

d) u, v, w, T, p

(47) Turbulence problems particularly depend on this term of the Navier-Stokes equations. Which is that term?

a) Rate of change term

b) Convection term

c) Diffusion term

d) Source term

(48) The diffusion term in the general transport equation is div(Γgradϕ). While equating this with the Navier-Stokes equations, what is Γ?

a) k

b) λ

c)
   μ

d)
   $\bar{V}$

(49) Diffusion terms are not included in _____ of the Navier-Stokes equations.

a) continuity equation

b) y-momentum equation

c) z-momentum equation

d) energy equation

(50) What type of flow can be taken for granted in a pipe of a uniform cross-section?

a) steady

b) unsteady

c) uniform

d) non-uniform

(51) Which of the following statements is true regarding one and two-dimensional flows?

a) Flow in a pipe is always taken as one-dimensional flow

b) Flow in a pipe is always taken as two-dimensional flow

c) Flow in a pipe is taken as one-dimensional flow when average flow parameters are considered

d) Flow in a pipe is taken as two-dimensional flow when average flow parameters are considered

(52) Which of the following is true?

a) Flow is laminar inside the boundary layer and turbulent outside

b) Flow is turbulent inside the boundary layer and laminar outside

c) Flow is laminar both inside and outside of the boundary layer

d) Flow is turbulent both inside and outside of the boundary layer

(53) Three flows named as 1,2 and 3 are observed. The Reynold's number for the three are 100, 1000 and 10000. Which of the flows will be laminar?

a) only 1

b) only 1 and 2

c) 1, 2 and 3

d) only 3

(54) Three flows named as 1,2 and 3 are observed. The flow velocities are v1 and v2. If all other geometrical factors remain the same along with the fluid considered, flow is more likely to be laminar?

a) flow 1 if v1 > v2

b) flow 2 if v1 > v2

c) always flow 1

d) always flow 2

(55) The principle of conservation is applicable to _____ systems.

a) Isolated system

b) Closed system

c) Open system

d) All the systems irrespective of its type

(56) Each parcel in the Lagrangian formulation is tagged using

a) Time-dependent position vector

b) Time-independent position vector

c) Time-dependent velocity vector

d) Time-independent velocity vector

(57) Which of these is an acceptable tag for Lagrangian parcels?

a) Parcel's centre of mass at instantaneous time

b) Parcel's centre of pressure at instantaneous time

c) Parcel's centre of mass at initial time

d) Parcel's centre of pressure at initial time

(58) The independent variables in Eulerian approach are _____ and _____

a) Instantaneous time and instantaneous position

b) Initial time and instantaneous position

c) Instantaneous time and Initial position

d) Initial time and initial position

(59) Which of the following is NOT a type of force considered in the Navier-Stokes equation?

a) Gravity force

b) Pressure force

c) Surface tension force

d) Viscous force

(60) The Bernoulli's equation in fluid dynamics is valid for

a) Compressible flows

b) Transient flows

c) Continuous flows

d) Viscous flows