F **917A1** Total Pages : **4**

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SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

SIXTH SEMESTER B.TECH DEGREE EXAMINATION (S), AUGUST 2023

MECHANICAL ENGINEERING

(2020 SCHEME)

Course Code : 20MET308

Course Name : Comprehensive Course Work

Max. Marks : 50 **Duration : 75 Minutes**

PART A

(Answer all questions. Each question carries 1 mark)

1 Bernoulli's equation in fluid dynamics describes the conservation of

A. Mass B. Energy

C. Momentum D. Viscosity

2 The type of fluid flow analysis where the observer remains stationery is called

A. Eulerian B. Lagrangian

C. Archamedis D. None

3 The region between the separation streamline and the boundary surface of the solid body is known as

A. Wake B. Lift

C. Drag D. Boundary Layer

4 A body floating in a liquid is said to be in neutral equilibrium, if its metacentre

A. coincides with its centre of gravity B. lies above its centre of gravity

C. lies below its centre of gravity D. lies between the centre of buoyancy and centre of gravity

5 Which of the following is a non-Newtonian fluid?

A. Water B. Air

C. Honey D. Mercury

6 Unit of surface tension is

A. N/m^2 B. Nm

C. N/m D. N

7 Which phase diagram region indicates a uniform composition of two phases?

A. Liquidus B. Solidus

C. Eutectic D. Peritectic

8 Hardenability of steel is assessed by

A. Charpy impact test B. Jominy end quench test

C. Open hole test D. Rockwell hardness test

9 Which source is responsible for the multiplication of dislocations in a crystal?

A. Forest dislocation B. Frank-Read source

C. Grain boundary D. Dislocation line

10 Which of the following type of materials are usually the most ductile?

A. BCC lattice
B. HCP lattice
C. FCC lattice
D. SC lattice

11 Line imperfections is known as

A. Edge dislocations
B. Misrun
C. Screw dislocations
D. Schottky defect

12 Atomic packing factor of FCC crystal structure is

A. 0.52
B. 0.68
C. 0.58
D. 0.74

13 What is the term used to describe the maximum possible efficiency of a heat engine operating between two temperature reservoirs?

A. Carnot efficiency
B. Rankine efficiency
C. Brayton efficiency
D. Otto efficiency

14 Considering relation between Kelvin-Planck and Clausius statement, if one statement between the two is violated then

A. other one may be or may not be violated
B. other one is also violated
C. other one must be correct
D. none of the above

15 In which thermodynamic process is heat transfer equal to zero

A. isentropic
B. isothermal
C. isobaric
D. isochoric

16 Which law states that it is impossible to construct a device that operates in a cycle and extracts no heat while delivering work?

A. Zeroth Law of Thermodynamics
B. First Law of Thermodynamics
C. Kelvin-Planck Statement
D. Clausius Statement

17 Which statement accurately describes a reversible process?

A. It occurs at a finite rate.
B. It always achieves maximum efficiency.
C. It involves irreversible changes.
D. It violates the second law of thermodynamics.

18 If a closed system is undergoing an irreversible process, the entropy of the system

A. must increase
B. must decrease
C. always remains constant
D. can increase, decrease or remain constant

19 Two surfaces A & B are to be joined together. Select the joining operation in which no melting of the contact surface occur while creating the joint.

A. arc welding
B. adhesive bonding
C. brazing
D. spot welding

20 The roll separating force between the rolls will increase if

A. roll diameter increases
B. roll diameter decreases
C. number of rolls increases
D. number of rolls decreases

21 In fusion welding process, within heat affected zone (HAZ) the work material undergoes

A. micro structural changes but does not melt
B. neither melting nor micro structural changes
C. both melting and micro structural after solidification
D. melting and retains the original micro structure after solidification

22 Which one among the following welding processes uses non-consumable electrode?

A. Gas metal arc welding
B. Submerged arc welding
C. Gas tungsten arc welding
D. Flux coated arc welding

23 Injection moulding is a process used for processing

A. Aluminium
B. Nickel
C. Steel
D. Plastics

24 Riser is designed so as to

A. minimize the time of pouring
B. freeze before the casting freezes
C. freeze at the same time as the casting
D. freeze after the casting freezes

25 What is the number of instantaneous centres of rotation for a 6-link mechanism?

A. 4
B. 6
C. 12
D. 15

26 In a kinematic chain, a quaternary joint is equivalent to:

A. One binary joint
B. Two binary joints
C. Three binary joints
D. Four binary joints

27 Midpoint of the floating link of elliptical trammel traces a

A. circle
B. parabola
C. ellipse
D. straight line

28 In a rigid link AB, the point B is moving with respect to A. Then the acceleration of B will be equal to

A. acceleration of A × distance AB
B. (acceleration of A) ÷ distance AB
C. vector sum of acceleration of A and acceleration of B, relative to A
D. acceleration of A × square of distance AB.

29 The type of quick return mechanism employed mostly in shaping machines is:

A. DC reversible motor
B. Fast and loose pulleys
C. Whitworth motion
D. Slotted link mechanism

30 When the relative motion between two elements is completely or successfully constrained, then these two elements from a

A. mechanism
B. machine
C. kinematic chain
D. kinematic pair

PART B

(Answer all questions. Each question carries 2 marks)

31 A tank containing water upto a depth of 650 mm is stationary. Find the force exerted by the fluid of specific gravity 0.55 on the side of the tank. The width of the tank is 1.5m

A. 3419.4N
B. 1709.9 N
C. 6838.8 N
D. 1367.75 N

32 Which of the following are examples of free vortex motion?

i. Motion of air in cyclone
ii. Motion of liquid at the bottom of wash basin
iii. Motion of liquid inside impeller of pump
iv. iv. Motion of eddies in rivers and canals

A. i., ii., and iv.
B. i., iii., and iv.
C. i., ii., and iii
D. All of the above

33 A metal sample has an original length of 10 cm. After applying a tensile stress, the sample elongates to 11 cm. What is the strain experienced by the sample?

A. 0.1 B. 0.01

C. 0.9 D. 0.09

34 A material has a Young's modulus of 200 GPa and a strain of 0.002. What is the stress experienced by the material?

A. 100 MPa B. 200 MPa

C. 400 MPa D. 800 MPa

35 In the study of phase diagrams, the rule which helps to calculate the relative proportions of liquid and solid material present in the mixture at any given temperature is known as

A. Hume-Rothery rule B. Empirical rule

C. Gibb's phase rule D. Lever rule

36 A steam turbine receives steam steadily at 10 bar with an enthalpy of 3000 kJ/kg and discharges at 1 bar with an enthalpy of 2700 kJ/kg. The work output is 250 kJ/kg. The changes in kinetic and potential energies are negligible. The heat transfer from the turbine casing to the surroundings is equal to

A. 0 kJ B. 50 kJ

C. 150 kJ D. 250 kJ

37 The number of dislocations is directly proportional to ……. and inversely proportional to …….

A. Shear modulus, Burgers vector B. Shear modulus, Stress

C. Stress, Shear modulus D. Burgers vector, Stress

38 The welding flame characterized by acetylene and oxygen in equal ratio is …….

A. Neutral flame B. premixed flame

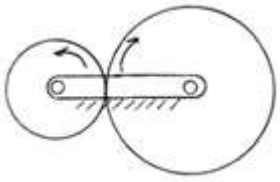
C. Oxidising flame D. Carburizing flame

39 The transmission angle in four bar mechanism is maximum or minimum for

A. $\theta=90°$ or $\theta=0°$ B. $\theta=30°$ or $\theta=90°$

C. $\theta=14.5°$ or $\theta=20°$ D. $\theta=180°$ or $\theta=0°$

40 The degrees of freedom for the mechanism shown below is



A. -1 B. 0

C. 1 D. 2