

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Sixth Semester B.Tech Degree Examination June 2022 (2019 Scheme)

**Course Code: MET308****Course name: COMPREHENSIVE COURSE WORK**

Max. Marks: 50

Duration: 1 Hour

- Instructions:**
- (1) Each question carries one mark. No negative marks for wrong answers
 - (2) Total number of questions: 50
 - (3) All questions are to be answered. Each question will be followed by 4 possible answers of which only ONE is correct.
 - (4) If more than one option is chosen, it will not be considered for valuation.

1. Which one of the following mechanisms represents an inversion of single slider crank chain?
 - a) Elliptical trammel
 - b) Oldham's coupling
 - c) Whitworth quick return mechanism
 - d) Pantograph
2. A planar mechanism has 10 links and 12 joints. The degree of freedom of the mechanism is
 - a) 1
 - b) 3
 - c) 2
 - d) 4
3. Number of instantaneous centres of rotation for a 6-link mechanism are
 - a) 4
 - b) 6
 - c) 12
 - d) 15
4. Pressure angle of a cam is directly proportional to
 - a) Pitch circle diameter
 - b) Prime circle diameter
 - c) Lift of cam
 - d) Base circle diameter
5. For the follower with stroke S following cycloidal motion, the radius of rolling circle will be
 - a) $S \cdot 2\pi$
 - b) $S/2\pi$
 - c) $2\pi/S$
 - d) $2\pi + S$
6. Which of the following mechanism is an exact straight line motion mechanism?
 - a) Watt's mechanism
 - b) Robert's mechanism
 - c) Peaucellier mechanism
 - d) All of these
7. Transmission angle is the angle between the
 - a) Output link and frame
 - b) Output link and coupler
 - c) Input link and frame
 - d) Input link and coupler
8. The Coriolis component of acceleration is taken into account for
 - a) Slider crank mechanism
 - b) Four bar chain mechanism
 - c) Quick return motion mechanism
 - d) All of these
9. The component of the acceleration, parallel to the velocity of the particle, at the given instant is called

- a) Radial component b) Tangential component c) Coriolis component d) None of these
10. For low and moderate speed engines the cam follower should move with
a) Cycloidal motion b) Simple Harmonic Motion c) Uniform velocity d) Uniform acceleration and retardation
11. Which sand is used for making ferrous and non-ferrous alloys
a) Natural sand b) Synthetic sand c) Loam sand d) Refractory sand
12. Which among the following wood is most widely used for making patterns
a) White Pine b) Mahogany c) Teak d) Maple
13. Which of the following has the most magnitude in rolling
a) Slip velocity b) Surface velocity c) Entering velocity d) Exiting velocity
14. The earing defect in the rolling of the work piece is not caused by _____
a) Material dependent b) Blank holding c) Low clearance between the roll and workpiece d) Too high speed
15. The extra metal which settles down in the gutter is known as
a) Flux b)) Barrelling c)) Slag d) Flash
16. The distance from the center of arc to the tip of electrode is called
a) Arc length b) Arc distance c) Arc crater d) Arc depth
17. Which of the following is not included in weldability
a) Ability of mechanical soundness b) Serviceability of joint c) Strain relieving brittleness d) Metallurgical compatibility of metal
18. As the grain size of a metal increases, its strength _____
a) Decreases b) Increases c) Remains constant d) No effect
19. Which of the following method is used for making crankshafts?
a) Drop forging b) Press forging c) Open die forging d) Closed die forging
20. Which is the operation to relive residual stress from the welding joint
a) Shot peening b) post heating c) peening d) Pre heating
21. Which of the following is the extensive property of the system
a) Volume b) Pressure c) Temperature d) Density
22. An ideal gas at 27°C is heated at constant pressure till its volume becomes three times. What would be then the temperature of the gas
a) 81°C b) 327°C c) 543°C d) 627°C

23. For a simple closed system of constant composition, the difference between the net heat and work interactions is identifiable as the change in
 a) Enthalpy b) Entropy c) Flow energy d) Internal Energy
24. A 4 kW, 20 litre water heater is switched on for 10 minutes. The heat capacity C_p for water is 4 kJ/kg-K. Assuming all the electrical energy has gone into heating the water, the increase of the water temperature is
 a) 15°C b) 20°C c) 26 °C d) 30°C
25. In throttling process, which one of the following parameters remains constant
 a) Temperature b) pressure c) entropy d) enthalpy
26. When a system undergoes a process such that $\int \frac{dQ}{T} = 0$ and $\Delta S > 0$, the process is
 a) Reversible b) Irreversible c) Isothermal d) None of these
 adiabatic adiabatic
27. For a heat engine operating on a Carnot cycle, the work output is $1/4^{\text{th}}$ of the heat transferred to the sink. The efficiency of the engine is
 a) 25% b) 30% c) 20% d) 33.3%
28. Which of the following devices complies with Clausius statement of the second law of thermodynamics
 1. Closed cycle gas turbine
 2. Internal combustion engine
 3. Steam powerplant
 4. Domestic refrigerator
 a) 1 only b) 1 and 4 only c) 2 and 3 only d) 4 only
29. For a given high temperature reservoir T_1 , as the difference between T_1 and T_2 increases, the COP of a Carnot heat pump
 a) Increases b) Decreases c) Does not change d) Cannot predict
30. Which of the following statements are correct?
 1. The entropy of a pure crystalline substance at absolute zero temperature is zero.
 2. The efficiency of a reversible heat engine is independent of the nature of the working substance and depends only on the temperature.
 3. Carnot's theorem states that of all heat engines operating between a given constant temperature source and a given constant temperature sink, none has a higher efficiency than a reversible engine.
 a) 1 and 2 only b) 1 and 3 only c) 2 and 3 only d) 1,2 and 3
31. Atomic packing factor of FCC crystal structure is
 a) 0.52 b) 0.58 c) 0.68 d) 0.74
32. Number of atoms and coordination number respectively for a BCC crystal structure is
 a) 2,8 b) 2,12 c) 4,8 d) 6,12
33. Edge dislocation is a
 a) Point imperfection b) Line imperfection c) Surface imperfection d) Volume imperfection

34. 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) Lever rule c) Gibb's phase rule d) Empirical rule
35. Fe-C alloy containing less than 0.8% carbon is called
 a) High speed steel b) Hypo-eutectoid steel c) Hyper-eutectoid steel d) Cast iron
36. What is the movement of block of atoms along certain crystallographic plane and direction, termed as
 a) Glide b) Twinning c) Slip d) Jog
37. Reaction in which solid phase transforms into two other solid phases on cooling is called
 a) Peritectic reaction b) Eutectic reaction c) Peritectoid reaction d) Eutectoid reaction
38. Gibb's phase rule is given by
 [F= Number of degrees of freedom, C= Number of components, P= Number of phases]
 a) $F = C+P$ b) $F = C+P-2$ c) $F = C-P-2$ d) $F = C-P+2$
39. TTT diagram shows the times required for isothermal transition from
 a) Austenite to pearlite b) Austenite to ferrite c) Ferrite to pearlite d) Martensite to pearlite
40. Hardenability of steel is assessed by
 a) Charpy impact test b) Rockwell hardness test c) Jominy end quench test d) Open hole test
41. Unit of surface tension is
 a) N/m^2 b) N/m c) Nm d) N
42. Relation between poise and $N \text{ sec}/m^2$ is
 a) $1 \text{ poise} = 1 \text{ N sec}/m^2$ b) $1 \text{ poise} = 10 \text{ N sec}/m^2$ c) $1 \text{ poise} = 0.1 \text{ N sec}/m^2$ d) $1 \text{ poise} = 0.01 \text{ N sec}/m^2$
43. A rectangular block with specific gravity x and height y when floating in water, the depth of immersion will be
 a) xy b) x/y c) y/x d) None
44. In a flow net the angle in degrees between stream lines and equipotential lines is
 a) 0 b) 45 c) 90 d) 180
45. Bernoulli's equation is law of conservation of
 a) mass b) momentum c) velocity d) energy
46. While deriving Euler's equation the following forces are considered
 a) Pressure and viscous b) Gravity and viscous c) Pressure and gravity d) Pressure and surface tension
47. The variation of shear stress and velocity at a cross section of a circular pipe when laminar flow takes place are
 a) Both parabolic b) Both linear c) Linear and parabolic d) Parabolic and linear

48. The ratio of maximum velocity to average velocity for a laminar flow through a circular pipe is
a) 1 b) 1.5 c) $4/3$ d) 2
49. For the flow of water through the penstocks of Idukki Power plant, the head loss due to friction is calculated using
a) Hagen- Poiseuille equation b) Darcy Weisbach equation c) Both d) None
50. The type of fluid flow analysis where the observer remains stationary is called
a) Eulerian b) Lagrangian c) Archimedes d) None
