Reg No.:_____   Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S6 (R, S) / S6 (PT) (R) Examination June 2023 (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 of the following conditions is used to determine the stable equilibrium of all partially submerged floating bodies?

    (a) Metacentre must be at a lower level than the centre of gravity

    (b) Centre of buoyancy must be below the centre of gravity

    (c) Centre of buoyancy must be above the centre of gravity

    (d) Metacentre must be at a higher level than the centre of gravity

2. For a Newtonian fluid,

    (a) shear stress is proportional to shear strain.

    (b) rate of shear stress is proportional to shear strain.

    (c) shear stress is proportional to rate of shear strain.

    (d) rate of shear stress is proportional to rate of shear strain.

3. A stream line and an equipotential line in a flow field

    (a) are parallel to each other   (b) are perpendicular to each other

    (c) intersect at an acute angle   (d) are identical

4. What is the vertical component of pressure force on submerged curved surface equal to?

    (a) Its horizontal component.

    (b) The force on a vertical projection of the curved surface.

    (c) The product of the pressure at centroid and surface area.

    (d) The gravity force of liquid vertically above the curved surface up to the free surface.

5. When is Bernoulli's equation applicable between any two points in a flow field?

    (a) The flow is steady, incompressible and rotational

    (b) The flow is steady, compressible and irrotational

    (c) The flow is unsteady, incompressible and irrotational

    (d) The flow is steady, incompressible and irrotational

6. A venturimeter of 20 mm throat diameter is used to measure the velocity of water in a horizontal pipe of 40 mm diameter. If the pressure difference between the pipe and throat sections is found to be 30 kPa then, neglecting frictional losses, the flow velocity is

    (a) 0.2 m/s   (b) 1.0 m/s   (c) 1.4 m/s   (d) 2.0 m/s

7. Stream lines, path lines and streak lines are virtually identical for
    (a) Uniform flow   (b) Flow of ideal fluids

    (c) Steady flow   (d) Non-uniform flow

8. Which law states that when a certain pressure is applied at any point in a fluid at rest the pressure is equally transmitted in all directions and to every other point in the fluid?

    (a) Newton's law   (b) Pascal's law

    (c) Stokes law   (d) Archimedes' principle

9. The fraction of the volume of a solid piece of metal of relative density 8.25 floating above the surface of a container of mercury of relative density 13.6 is

    (a) 1.648   (b) 0.607   (c) 0.393   (d) 0.352

10. Which one of the following is correct for 'Burgers vector' in screw dislocation?

    (a) It is perpendicular to the dislocation line   (b) It is inclined to the dislocation line

    (c) It is parallel to the dislocation line   (d) It is opposite to the dislocation line

11. 'Tempering' of quenched martensite steel is necessary to improve the

    (a) hardness of the metal   (b) surface texture of the metal

    (c) corrosion resistance of the metal   (d) ductility of the metal

12. The effective number of atoms per unit cell in a BCC crystal lattice is

    (a) 2   (b) 4   (c) 6   (d) 8

13. Plastic deformation is caused by

    (a) stored elastic energy   (b) dislocation motion

    (c) low value of modulus   (d) complex elastic stress

14. Cast steel crankshaft surface is hardened by

    (a) nitriding   (b) normalizing

    (c) carburizing   (d) induction hardening

15. Surface imperfections which separate two orientations that are mirror images of one another is called

    (a) stacking fault   (b) grain boundary

    (c) tilt boundary   (d) twinned boundary

16. Which one of the following defects is 'Schottky defect'?

    (a) Vacancy defect   (b) Compositional defect

    (c) Interstitial defect   (d) Surface defect

17. A reaction in which liquid and solid on cooling get converted into another solid is known as

    (a) eutectoid reaction   (b) eutectic reaction

    (c) peritectic reaction   (d) peritectoid reaction

18. The crystal structure of γ iron (austenite phase) is

    (a) BCC   (b) BCT   (c) HCP   (d) FCC

19. TTT diagram indicates time and temperature transformation of

    (a) cementite   (b) pearlite   (c) ferrite   (d) austenite

20. Which of the following is an intensive property of a system?

    (a) pressure   (b) mass   (c) enthalpy   (d) volume

21. Measurement of temperature is based on which law of thermodynamics?

    (a) Zeroth law of thermodynamics   (b) First law of thermodynamics

    (c) Second law of thermodynamics   (d) Third law of thermodynamics

22. For a closed system, the difference between the heat added to the system and the work done by the system is equal to

    (a) enthalpy   (b) entropy   (c) temperature   (d) internal energy

23. A system undergoes a change of state during which 80 kJ of heat is transferred to it and it does 60 kJ of work. The system is brought back to its original state through a process during which 100 kJ of heat is transferred to it. The work done by the system is

    (a) 40 kJ   (b) 60 kJ   (c) 120 kJ   (d) 180 kJ

24. In a throttling process, which one of the following parameters remain constant?

    (a) Temperature   (b) Pressure   (c) Enthalpy   (d) Entropy

25. Availability of a system at any given state is

    (a) a property of the system

    (b) the maximum work obtainable as the system goes to dead state

    (c) the total energy of the system

    (d) the maximum useful work obtainable as the system goes to dead state

26. The law, which states that heat and work are mutually convertible, is known as

    (a) Zeroth law of thermodynamics   (b) first law of thermodynamics

    (c) second law of thermodynamics   (d) none of the above.

27. Internal energy of a gas is a function of

    (a) pressure   (b) pressure and volume   (c) temperature   (d) entropy.

28. Second law of thermodynamics defines

    (a) heat   (b) entropy   (c) enthalpy   (d) work.

29. Absolute zero temperature is taken as

    (a) $-273°C$ (b) $273°C$ (c) $237°C$ (d) $-373°C$

30. The replica of the part to be cast is called _____

    (a) Mould   (b) Pattern   (c) core   (d) Spruce

31. Riser is provided in the mould

    (a) To supply metal to mould cavity to compensate for shrinkage solidification

    (b) To fill the mould cavity with molten metal for making the casting

    (c) For rapid cooling of the casting

    (d) For making intricate shapes in casting

32. Misrun is a casting defect which occurs due to

    (a) very high pouring temperature of the metal

    (b) insufficient fluidity of the molten metal

    (c) absorption of gases by the liquid metal

    (d) improper alignment of the mould flasks

33. The decision on the volume of the design riser is based on

(a) Bernoulli's equation

(b) Continuity equation

(c) Newton's law of viscosity

(d) Chvorinov's rule

34. The purpose of chaplets in moulding is

(a) to support chills

(b) to support the pattern

(c) to support cores

(d) to achieve directional solidification

35. The casting process which uses rotating mould is

(a) slush casting

(b) centrifugal casting

(c) die casting

(d) continuous casting

36. The welding process in which heat is produced for welding by chemical reaction is known as

(a) forge welding

(b) resistance welding

(c) gas welding

(d) thermit welding.

37. Which of the following welding processes used consumable electrodes?

(a) MIG welding

(b) TIG welding

(c) CIG welding

(d) Sub-merged arc welding

38. In a rolling process, the state of stress of the material undergoing deformation is

(a) pure compression

(b) pure shear

(c) compression and shear

(d) tension and shear

39. In the forging operation, fullering is done to

(a) draw out the material

(b) bend the material

(c) upset the material

(d) extrude the material

40. The mechanism used in a shaping machine is

(a) a closed 4-bar chain having 4 revolute pairs

(b) a closed 6-bar chain having 6 revolute pairs

(c) a closed 4-bar chain having 2 revolute and 2 sliding pairs

(d) an inversion of the single slider-crank chain

41. The number of degrees of freedom of a planar linkage with 8 links and 9 simple revolute joints is

(a) 1   (b) 2   (c) 3   (d) 4

42. The number of inversions for a slider crank mechanism is

    (a) 6   (b) 5   (c) 4   (d) 3

43. Which of the following is the higher pair?

    (a) belt and pulley   (b) turning pair   (c) screw pair   (d) sliding pair

44. The total number of instantaneous centers for a mechanism consisting of 'n' links is

    (a) $n/2$ (b) n (c) $(n-1)/2$ (d) $n(n-1)/2$

45. In which of the following mechanism, the Coriolis component of acceleration exists ?

    (a) Shaper mechanism   (b) Whitworth Quick Return mechanism

    (c) Tangent cam mechanism   (d) All of the above

46. The smallest circle drawn to the cam profile from the cam centre is known as

    (a) prime circle   (b) base circle   (c) pitch circle   (d) pitch curve

47. The point, on the cam pitch curve having the maximum pressure angle, is called

    (a) the pitch point   (b) the trace point   (c) the centre of cam   (d) none of the above

48. Scotch yoke mechanism is used to generate

    (a) sine function   (b) square roots   (c) logarithms   (d) inversions

49. Which of the following statements is incorrect?

    (a) Grashof's rule states that for a planar crankrocker four-bar mechanism, the sum of the shortest and longest link lengths cannot be less than the sum of the remaining two link lengths.

    (b) Inversions of a mechanism are created by fixing different links one at a time.

    (c) Geneva mechanism is an intermittent motion device

    (d) Gruebler's criterion assumes mobility of a planar mechanism to be one.

50. A kinematic chain is known as a mechanism when ...... of the links is fixed.

    (A) Three   (B) One   (C) Two   (D) Four

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