M.E. Mechanical Engineering

1. A cube shaped solidifies in 5min. The solidification time in min for a cube of the same material, which is 8 times heavier than the original casting, will be

A) 10 B) 20 C) 24 D) 40

2. In a CAD package, mirror image of a 2D point P(5,10) is to be obtained about a line which passes through the origin and makes an angle of 45^0 counterclockwise with the X-axis. The coordinates of the transformed point will be:

A) (7.5, 5) B) (10, 5) C) (7.5, –5) D) (10, –5)

3. Two cutting tools are being compared for a machining operation. The tool life equations are:

Carbide tool: $VT^{1.6} = 3000$

HSS tool: $VT^{0.6} = 200$

Where V is the cutting speed in m/min and T is the tool life in min. The carbide tool will provide higher tool life if the cutting speed in m/min exceeds

A) 15.0 B) 39.4 C) 49.3 D) 60.0

4. During normalizing process of steel, the specimen is heated

A) Between the upper and lower critical temperature and cooled in still air.
B) Above the upper critical temperature and cooled in furnace.
C) Above the upper critical temperature and cooled in still air.
D) Between the upper and lower critical temperature and cooled in furnace

5. A solid cylinder of diameter 100 mm and height 50 mm is forged between two frictionless flat dies to a height of 25mm. The percentage change in diameter is

A) 0 B) 2.07 C) 20.7 D) 41.4

6. The maximum possible draft in cold rolling of sheet increases with the

A) Increase in coefficient of friction B) Decrease in coefficient of friction
C) Decrease in roll radius D) Increase in roll velocity

7. A cubic casting of 50 mm side undergoes volumetric solidification shrinkage and volumetric solid contraction of 4% and 6% respectively. No riser is used. Assume uniform cooling in all directions. The side of the cube after solidification and contraction is:

A) 48.32 mm B) 49.90 mm C) 49.94 mm D) 49.96 mm

8. Friction at the tool-chip interface can be reduced by

A) Decreasing the rake angle B) Increasing the depth of cut
C) Decreasing the cutting speed D) Increasing the cutting speed

9. The effective number of lattice points in the unit cell of simple cubic, body centered cubic, and face centered cubic space lattices, respectively, are

A) 1, 2, 2 B) 1, 2, 4 C) 2, 3, 4 D) 2, 4, 4

10. The crystal structure of austenite is

A) Body centered cubic B) Face centered cubic

C) Hexagonal closed packed D) Body centered tetragonal

11. In a condenser of a power plant, the steam condenses at a temperatures of 60^0C. The cooling water enters at 30^0C and leaves at 45^0C. The logarithmic mean temperature difference (LMTD) of the condenser is

A) 16.2^0C B) 21.6^0C C) 30^0C D) 37.5^0C

12. If a mass of moist air in an airtight vessel is heated to a higher temperature, then

A) Specific humidity of the air increases B) Specific humidity of the air decreases

C) Relative humidity of the air increases D) Relative humidity of the air decreases

13. A streamline 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

14. A thin cylinder of inner radius 500 mm and thickness 10 mm is subjected to an internal pressure of 5 MPa. The average circumferential (hoop) stress in MPa is:

A) 100 B) 250 C) 500 D) 1000

15. The word 'kanban' is most appropriately associated with

A) Economic order quantity B) Just-in-time production

C) Capacity planning D) Product design

16. Two identical ball bearings P and Q are operating at loads 30 kN and 45 kN respectively. The ratio of the life of bearing P to the life of bearing Q is

A) 81/16 B) 27/ 8 C) 9/4 D) 3/2

17. The values of enthalpy of steam at the inlet and outlet of a steam turbine in a Rankine cycle are 2800 kJ/kg and 1800 kJ/kg respectively. Neglecting pump work, the specific steam consumption in kg/kW hour is

A) 3.60 B) 0.36 C) 0.06 D) 0.01

18. A pump handing a liquid raises its pressure from 1 bar to 30 bar. Take the density of the liquid as 990 kg/m3. The isentropic specific work done by the pump in kJ/kg is

A) 0.10 B) 0.30 C) 2.50 D) 2.93

19. The ratios of the laminar hydrodynamic boundary layer thickness to thermal boundary layer thickness of flows of two fluids P and Q on a flat plate are ½ and 2 respectively. The Reynolds number based on the plate length for both the flows is 10^4. The Prandtl and Nusselt numbers for P are 1/8 and 35 respectively. The Prandtl and Nusselt numbers for Q are respectively

A) 8 and 140 B) 8 and 70 C) 4 and 40 D) 4 and 35

20. The ratio of momentum diffusivity (ν) to thermal diffusivity (α), is called

A) Prandtl number B) Nusselt number
C) Biot number D) Lewis number

21. A shaft with a circular cross-section is subjected to pure twisting moment. The ratio of the maximum shear stress to the largest principal stress is

A) 2.0 B) 1.0 C) 0.5 D) 0

22. A vibrating machine is isolated from the floor using springs. If the ratio of excitation frequency of vibration of machine to the natural frequency of the isolation system is equal to 0.5, then transmissibility ratio of isolation is

A) 1/2 B) 3/4 C) 4/3 D) 2

23. In the window air conditioner, the expansion device used is

A) Capillary tube B) Thermostatic expansion valve
C) Automatic expansion valve D) Float valve

24. At the time of starting, idling and low speed operation, the carburretor supplies a mixture which can be termed as

A) Lean
B) Sslightly leaner than stoichiometric
C) Stoichiometric
D) Rich

25. Environment friendly refrigerant R134 is used in the new generation domestic refrigerators. Its chemical formula is

A) $CHClF_2$ B) $C_2Cl_3F_3$ C) $C_2Cl_2F_4$ D) $C_2H_2F_4$

26. In PERT analysis a critical activity has

A) Maximum Float
B) Xero Float
C) Maximum Cost
D) Minimum Cost

27. A solid circular shaft of 60 mm diameter transmits a torque of 1600 N.m. The value of maximum shear stress developed is

A) 37.72 MPa
B) 47.72 MPa
C) 57.72 MPa
D) 67.72 MPa

28. Hardness of steel greatly improves with

A) Annealing B) Cyaniding C) Normalizing D) Tempering

29. It is desired to measure the Young's modulus and the Poisson's ratio of a given homogeneous, isotropic material. A bar of length 20cm and square crosssection 10mm x 10 mm mm of this material is subjected to a tensile load of 40kN. Under this load, length increases to 20.1 cm while the cross-section reduces to 9.98mm x 9. 98mm. Young's modulus and Poisson's ratio of the material are:

A) 80 GPa and 0.4 respectively
B) 40 GPa and –0.4 respectively
C) 80 GPa and –0.2 respectively
D) 40 GPa and 0.2 respectively

30. For a fifty percent reaction axial compressor stages, following statements are given:

I. Velocity triangles at the entry and exit of the rotor are symmetrical

II. The whirl or swirl component of absolute velocity at the entry of rotor and entry of stator are same.

Which of the following options are correct?

A) Both I and II are correct statements
B) I is correct but II is incorrect
C) I is incorrect but II is correct
D) Both I and II are incorrect

31. A small rocket having a specific impulse of 200 s produces a total thrust of 98kN, out of which 10 kN is the pressure thrust. Considering the acceleration due to gravity to be 9.8m /s^2, the propellant mass flow rate in kg/s is

A) 55.1 B) 44.9 C) 50 D) 60.2

32. The thrust produced by a turbojet engine

A) Increases with increasing compressor pressure ratio

B) Decreases with increasing compressor pressure ratio

C) Remains constant with increasing compressor pressure ratio

D) First increases and then decreases with increasing compressor pressure ratio

33. What is the Poissions ratio of an elastic incompressible material?

A) 0.3 B) 0.5 C) 0.1 D) 0.4

34. For an incompressible flow through a pipe of constant diameter in the fully developed region the mean velocity ios constant. What about the mean velocity in developing region?

A) Half of the mean velocity in fully developed region

B) Equal to the mean velocity in fully developed region

C) Twice of the mean velocity in fully developed region

D) Thrice of the mean velocity in fully developed region

35. Which of the following is not a rotary machinery

A) Centrifugal pump B) Jet pump

C) Gear pump D) Vortex pump

36. Which theory of failure will you use for aluminium components under steady loading?

A) Principal stress theory B) Principal strain theory

C) Strain energy theory D) Maximum shear stress theory

37. A solid circular shaft of 60 mm diameter transmits a torque of 1600 N.m. The value of maximum shear stress developed is:

A) 37.72 MPa B) 47.72 MPa C) 57.72 MPa D) 67.72 MPa

38. Which of the following are intensive properties?

1) Kinetic Energy 2) Specific Enthalpy

3) Pressure 4) Entropy

Select the correct answer using the code given below:

A) 1 and 3 B) 2 and 3 C) 1, 3 and 4 D) 2 and 4

39. A heat engine is supplied with 2512kJ/min of heat at 650°C. Heat rejection with 900kJ/min takes place at 100°C. This type of heat engine is

A) Ideal B) Irreversible C) Impossible D) Practical

40. An inventor states that his new conceptual engine, while operating between temperature limits of 377°C and 27°C, will reject 50% of heat absorbed from the source. What type of cycle will this engine have?

A) Carnot cycle B) Stirling cycle

C) Impossible cycle D) Possible cycle

41. A metric thread of pitch 2mm and thread angle 60° is inspected for its pitch diameter using 3-wire method. The diameter of the best size wire in mm is

A) 0.86 B) 1.0 C) 1.15 D) 2.0

42. Soderberg relation is based on _____ of the material whereas all other failure relation for dynamic loading are based on ultimate strength of the material

A) Elastic strength B) Yield strength

C) Shear strength D) All of the above

43. In grey cast iron, carbon is present in the form of

A) Cementite B) Free carbon

C) Flakes D) Spheroids

44. Cutting forces at the cutting tool can be measured by

A) A dynamometer B) A viscosity meter

C) A sine bar D) A combination set

45. Plastic bottles are manufactured using the process of

A) Blow moulding B) Injection moulding

C) Atomizing D) Die casting

46. When the front wheels are not parallel to each other and moved further away at the top it is termed as

A) Positive camber B) Negative camber

C) Roll out D) Roll in

47. The dry bulb temperature lines of psychometric chart are

A) Vertical B) Horizontal C) Inclined D) Curved

48. The inlet value of a four stroke cycle I.C engine remains open for nearly

A) 180° B) 125° C) 235° D) 200°

49. In orthographic projections, the rays are assumed to

A) Diverge from station point B) Converge from station point

C) Be parallel D) None of these

50. Waste heat can be effectively used in which one of the following refrigeration systems

A) Vapour compression refrigeration cycle

B) Air refrigeration cycle

C) Vapour absorption refrigeration cycle

D) Vortex refrigeration cycle

51. Flaring is performed accurately by using a

A) Ball peen hammer B) Chisel

C) Flaring block D) Torch to soften the metal

52. A negative loop in the P.V diagram of an I.C engine is due to

A) Pre ignition in the engine B) Suction of air for engine

C) Pre opening of the exhaust valve D) High pressure in the cylinder

53. The crystal structure of α iron is

A) Simple Cubic B) Face centered cubic

C) Body centered cubic D) Close packed hexagonal

54. To show the internal parts of machine components, the section lines are drawn at angle of

A) 45^0 B) 0^0 C) 60^0 D) 90^0

55. The Weber number in dimensionless system is expressed as

A) $\frac{V}{\sqrt{\sigma/\rho L}}$ B) $\frac{V}{\sigma\sqrt{\rho L}}$ C) $\frac{\sigma V}{\sqrt{\rho L}}$ D) $\frac{\sqrt{\sigma/\rho L}}{V}$

Where σ is surface tension per unit length.

56. Work study includes

A) Method study B) Motion study

C) Time study D) All of the above

57. At breakeven point

A) Fixed costs are recovered B) Variable costs are recovered

C) Total costs are recovered D) Some costs are recovered

58. 58 A flywheel connected to a punching machine has to supply energy of 400 Nm while running at a mean angular speed of 20radians/s. If the total fluctuation of speed is not to exceed ±2%, the mass moment of inertia of the flywheel in kg-m^2 is

A) 25 B) 50 C) 100 D) 125

59. A planar closed kinematic chain is formed with rigid links PQ = 2.0m, QR = 3.0m, RS = 2.5m and SP = 2.7m with all revolute joints. The link to be fixed to obtain a double rocker (rocker-rocker) mechanism is

A) PQ B) QR C) RS D) SP

60. 60 The following four unconventional machining processes are available in a shop floor. The most appropriate one to drill a hole of square cross section of 6 mm × 6 mm and 25 mm deep

A) Is abrasive Jet Machining B) Is Plasma Arc Machining

C) Is Laser Beam Machining D) Is Electro Discharge Machining

61. The flatness of a machine bed can be measured using

A) Vernier calipers B) Auto collimator

C) Height gauge D) Tool maker's microscope

62. T. T. T diagram indicates time and temperature transformation of

A) Cementite B) Pearlite C) Ferrite D) Austenite

63. A 6 x19 rope implies that there are

A) 6 wires in each strand and 19 strands in the rope

B) 6 strands and 19 wires in each rope

C) 6 large diameter wires and 19 small diameter

D) 19 large diameter wire and 6 small diameter wires

64. In involute gears, the pressure angle is

A) Dependent on the size of teeth B) dependent on the size of gears

C) Always constant D) Always variable

65. A coil is having stiffness *k*. If it cut into two halves, then the stiffness of the cut coils will be

A) Same B) Half C) Double D) One fourth

66. Automobile engines are usually designed as multi-cylinder engine because of

A) Economy reasons B) Higher efficiency

C) Better balance, uniform torque output D) lower fuel consumption

67. Which type of maintenance is most expensive

A) Routine maintenance B) Preventive maintenance

C) Breakdown maintenance D) Planned maintenance

68. In a spring-mass system, the mass is 0.1 kg and the stiffness of the spring is 1 kN/m. By introducing a damper, the frequency of oscillation is found to be 90% of the original value. What is the damping coefficient of the damper?

A) 1.2 N.s/m B) 3.4 N.s/m C) 8.7 N.s/m D) 12.0 N.s/m

69. Bell-Coleman cycle is a

A) Reversed Carnot cycle B) Reversed Otto cycle

C) Reversed Joule cycle D) Reversed Rankine cycle

70. Three machines M_1, M_2 and M_3 produce identical items. Of their respective output 5%, 4% and 3% of items are faulty. On a certain day, M_1 has produced 25% of the total output, M_2 has produced 30% and M_3 the remainder. An item selected at random is found to be faulty. What are the chances that it was produced by the machine with the highest output?

A) 0.155 B) 0.255 C) 0.355 D) 0.455

71. When a plane is perpendicular to both HP and VP, its front view will be

A) Parallel to x y

B) Perpendicular to x y

C) Neither parallel nor perpendicular to x y

D) None

72. A line inclined to both HP and VP will have its top view

A) Parallel to x y

B) Perpendicular to x y

C) Inclined to x y

D) Both (B) and (C)

73. The Coefficient of fluctuation of energy of flywheel is given a

Where E_{max} = Maximum Kinetic energy of the Flywheel

E_{min} = Minimum Kinetic energy of the Flywheel

A) $(E_{max} - E_{min})$/Work done per cycle

B) $(E_{max} + E_{min})$/Work done per cycle

C) $(E_{max} - E_{min})$ x Work done per cycle

D) $(E_{max} + E_{min})$ x Work done per cycle

74. String diagram is used

A) For checking the relative values of various layouts
B) When a group of workers are working at a plac
C) Where processes require the operator to be moved from one place to another
D) All of the above

75. In shaper machine tool, workpiece …….. and tool ……

A) Reciprocates, rotates

B) Remains stationary, rotates

C) Remain stationary, reciprocates

D) Rotates, reciprocates

x-x-x