

MTECH CET SAMPLE PAPER

MECHANICAL ENGINEERING

1. Metal patterns are used for
 - a. Small castings
 - b. Large casting
 - c. Complicated casting
 - d. Large scale production of castings
2. Vehicle manufacturing assembly line is an
 - a. Product layout
 - b. Process layout
 - c. Manual layout
 - d. Fixed layout
3. In arc welding, the electric arc is produced between the work and the electrode by
 - a. Voltage
 - b. Flow of current
 - c. Contact resistance
 - d. All of these
4. Work done is said to be zero, when
 - a. Same force acts on a body, but displacement is zero
 - b. No force acts on a body but some displacement takes place
 - c. Either (a) or (b)
 - d. None of the above

5. The equation of motion for a spring-mass system excited by a harmonic force is

$$M\ddot{x} + kx = F \cos(\omega t)$$

Where M is the mass, k is the spring stiffness, F is the force amplitude and ω is the frequency of excitation. Resonance occurs when ω is equal to.

- a. $\sqrt{M/k}$
- b. $\frac{1}{2\pi}\sqrt{k/M}$
- c. $2\pi\sqrt{k/M}$
- d. $\sqrt{k/M}$

6. If σ_1 and σ_3 are the algebraically largest and smallest principal stresses respectively, the value of the maximum shear stress is
- $\frac{(\sigma_1 + \sigma_3)}{2}$
 - $\frac{(\sigma_1 - \sigma_3)}{2}$
 - $\sqrt{(\sigma_1 + \sigma_3)/2}$
 - $\sqrt{(\sigma_1 - \sigma_3)/2}$
7. Which one of the following statement is correct for a superheated vapor
- Its pressure is less than the saturation pressure at a given temperature
 - Its temperature is less than the saturation temperature at a given pressure
 - Its volume is less than the volume of the saturated vapor at a given temperature
 - Its enthalpy is less than the enthalpy of the saturated vapor at a given pressure
8. Pre-tensioning of a bolted joint is used to
- Strain harden the bolt head
 - Decrease stiffness of the bolted joint
 - Increase stiffness of the bolted joint
 - Prevent yielding of the thread root
9. Metal removal in electric discharge machining takes place through
- Ion displacement
 - Melting and vaporization
 - Corrosive reaction
 - Plastic shear
10. The preferred option for holding an odd-shaped work piece in a center lathe is
- Live and dead centers
 - Three jaw chuck
 - Lathe dog
 - Four jaw chuck
11. Which one of the following is NOT a rotating machine
- Centrifugal pump
 - Gear pump
 - Jet pump
 - Vane pump
12. The Poisson's ratio for a perfectly incompressible linear elastic material is
- 1
 - 0.5
 - 0
 - Infinity

13. Consider a beam with circular cross-section of diameter 'd'. The ratio of the second moment of area about the neutral axis to the section modulus of the area is
- $d/2$
 - $\pi d/2$
 - d
 - πd
14. The "Jominy test" is used to find
- Young's modulus
 - Hardenability
 - Yield strength
 - Thermal conductivity
15. Under optimal conditions of the process the temperatures experienced by a copper work piece in fusion welding, brazing and soldering are such that
- $T_{\text{welding}} > T_{\text{soldering}} > T_{\text{brazing}}$
 - $T_{\text{soldering}} > T_{\text{welding}} > T_{\text{brazing}}$
 - $T_{\text{brazing}} > T_{\text{welding}} > T_{\text{soldering}}$
 - $T_{\text{welding}} > T_{\text{brazing}} > T_{\text{soldering}}$
16. The part of a gating system which regulates the rate of pouring of molten metal is
- Pouring basin
 - Runner
 - Choke
 - In gate
17. 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
- 2.0
 - 1.0
 - 0.5
 - 0
18. A thin cylinder pressure vessel with closed ends is subjected to internal pressure. The ratio of circumferential (hoop) stress to the longitudinal stress is
- 0.25
 - 0.50
 - 1.0
 - 2.0

19. Assuming constant temperature condition and air to be an ideal gas, the variation in atmospheric pressure with height calculated from fluid statics is
- Linear
 - Exponential
 - Quadratic
 - Cubic
20. The internal energy of an ideal gas is a function of
- Temperature and pressure
 - Volume and pressure
 - Entropy and pressure
 - Temperature only
21. The welding process which uses a blanket of fusible granular flux is
- Tungsten inert gas welding
 - Submerged arc welding
 - Electro slag welding
 - Thermit welding
22. Which of the bearing given below SHOULD NOT be subjected to a thrust load
- Deep groove ball bearing
 - Angular contact ball bearing
 - Cylindrical (straight) roller bearing
 - Single row tapered roller bearing
23. Engineering strain of a mild steel sample is recorded as 0.100%. the true strain is
- 0.010%
 - 0.055%
 - 0.099%
 - 0.101%
24. Internal gears are manufactured by
- Hobbing
 - Shaping with pinion cutter
 - Shaping with rack cutter
 - Milling
25. A gas is stored in a cylindrical tank on inner radius 7m and wall thickness 50mm. the gauge pressure of the gas is 2 MPa. The maximum shear stress (in MPa) in the wall is
- 35
 - 70
 - 140
 - 280

26. In plane stress condition, the components of stress at a point are $\sigma_x = 20\text{MPa}$, $\sigma_y = 80\text{MPa}$ and $\tau_{xy} = 40\text{MPa}$. The maximum shear stress (in MPa) at the point is
- 20
 - 25
 - 50
 - 100
27. A single degree freedom spring mass system is subjected to a sinusoidal force of 10N amplitude and frequency ω along the axis of the spring. The stiffness of the spring is 15 N/m, damping factor is 0.2 and the un-damped natural frequency is 10ω . At steady state, the amplitude of vibration (in m) is approximately
- 0.05
 - 0.07
 - 0.70
 - 0.90
28. The head loss for a laminar incompressible flow through a horizontal circular pipe is h_1 . Pipe length and fluid remaining the same, if the average flow velocity doubles and the pipe diameter reduces to half its previous value the head loss is h_2 . The ratio of h_2/h_1
- 1
 - 4
 - 8
 - 16
29. In PERT chart, the activity time distribution is
- Normal
 - Binomial
 - Poisson
 - Beta
30. PERT and CPM are
- Techniques to determine project status
 - Decision making techniques
 - Aids to the decision makers
 - Charts which increase aesthetic appearance of rooms

31. Match the following products with the suitable manufacturing process

	Product		Manufacturing process
P	Toothpaste tube	1	Centrifugal casting
Q	Metallic pipes	2	Blow moulding
R	Plastic bottles	3	Rolling
S	Threaded bolts	4	Impact extrusion

- a. P-4, Q-3, R-1, S-2
- b. P-2, Q-1, R-3, S-4
- c. P-4, Q-1, R-2, S-3
- d. P-1, Q-3, R-4, S-2

32. The minimum axial compressive load P , required to initiate buckling for a pinned-pinned slender column with bending stiffness EI and length L is

- a. $P = \pi^2 EI / 4L^2$
- b. $P = \pi^2 EI / L^2$
- c. $P = 3\pi^2 EI / 4L^2$
- d. $P = 4\pi^2 EI / 4L^2$

33. A particle of unit mass is moving on a plane. Its trajectory, in polar coordinates, is given by $r(t)=t^2$, $\theta(t) = t$; where t is time. The kinetic energy of the particle at time $t=2$ is

- a. 4
- b. 12
- c. 16
- d. 24

34. The damping ratio for a viscous damped spring mass system, governed by the relationship

$$M \frac{d^2x}{dt^2} + C \frac{dx}{dt} + kx = F(t), \text{ is given by}$$

- a. $\sqrt{c/mk}$
- b. $c/2\sqrt{km}$
- c. $c/\sqrt{km}$
- d. $\sqrt{c/2mk}$

35. In an arc welding process, welding speed is doubled. Assuming all other process parameter to be constant, the cross sectional area of the weld bead will

- a. Increase by 25%
- b. Increase by 50%
- c. Reduce by 25%
- d. Reduce by 50%

36. A cantilever beam having square cross-section of side 'a' is subjected to an end load. If 'a' is increased by 19%, the tip deflection decreases approximately by,
- 19%
 - 29%
 - 41%
 - 50%
37. The spring constant of a helical compression spring DOES NOT depend on
- Coil diameter
 - Material strength
 - Number of active turns
 - Wire Diameter
38. Which of the following statements are TRUE with respect to heat and work
- They are boundary phenomena
 - They are exact differentials
 - They are path functions
- Both (i) and(ii)
 - Both (i) and (iii)
 - Both (ii) and (iii)
 - Only (iii)
39. For the same values of peak pressure, peak temperature and heat rejection, the correct order of efficiencies for Otto, Dual and Diesel cycle is
- $\eta_{\text{Otto}} > \eta_{\text{Dual}} > \eta_{\text{Diesel}}$
 - $\eta_{\text{Diesel}} > \eta_{\text{Dual}} > \eta_{\text{Otto}}$
 - $\eta_{\text{Dual}} > \eta_{\text{Diesel}} > \eta_{\text{Otto}}$
 - $\eta_{\text{Diesel}} > \eta_{\text{Otto}} > \eta_{\text{Dual}}$
40. Within a boundary layer for a steady incompressible flow, the Bernoulli equation
- Hold because the flow is steady
 - Hold because the flow is incompressible
 - Hold because the flow is transitional
 - Does not hold because the flow is frictional
41. Which two of the following joining process are autogeneous
- Diffusion welding
 - Electro slag welding
 - Tungsten inert gas welding
 - Friction welding
- (i) and (iv)
 - (ii) and (iii)
 - (ii) and (iv)
 - (i) and (iii)

42. The major difficulty during welding of aluminum is due to its
- High tendency of oxidation
 - High thermal conductivity
 - Low melting point
 - Low density
43. To solve the FEM problem, it subdivides a large problem into smaller, simpler parts that are called
- Finite elements
 - Infinite elements
 - Dynamics elements
 - Static elements
44. FEM gives accurate representation of
- Real geometry
 - Complex geometry
 - Real and complex geometry
 - Constant geometry
45. The following is true for a robot and NC machine
- Similar power drive technology is used in both
 - Different feedback system are used in both
 - Programming is same for both
 - All of the above
46. 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° counter clockwise with the x-axis. The coordinates of the transformed point will be
- (7.5, 5)
 - (10, 5)
 - (7.5, -5)
 - (10, -5)
47. In computer aided drafting practice, an arc is defined by
- Two end point only
 - Center and radius
 - Radius and one end point
 - Two end points and center

48. The shape of the Bezier curve is controlled by
- Control points
 - Knots
 - End points
 - All the above
49. Changing position of an object against an opposing force is called
- Power
 - Torque
 - Energy
 - Work
50. The ease with which a liquid changes to a vapour is called its
- Vaporability
 - Boiling point
 - Viscosity
 - Volatility
51. Aluminum alloy pistons are preferred because
- They are good absorbers of shock
 - They are having less weight
 - They have good water resistance
 - They are very strong in tension
52. Whirling of the propeller shaft is mainly due to
- The transmission of torsional vibration of the crankshaft
 - The use of a sliding joint in the propeller shaft
 - The use of universal joint in the drive
 - Lack of balance and excessive length of propeller shaft
53. In a diesel engine the fuel injection pressure is in the range
- 100 to 170 atm
 - 60 to 70 atm
 - 30 to 40 atm
 - 20 to 25 atm
54. The coefficient of rolling resistance for a truck weighing 63 500 N is 0.018. The rolling resistance to the truck is
- 1.143 N
 - 11.43 N
 - 114.3 N
 - 1143 N

55. If the air-fuel mixture ignites before the spark takes place at spark plug, the condition is called
- Detonation
 - Pre-ignition
 - Ignition
 - Rumble
56. The natural gas is compressed in a CNG cylinder at a pressure of
- 200 bar
 - 220 bar
 - 250 bar
 - 300 bar
57. A closed system is one in which
- Mass does not cross boundaries of the system, though energy may do so.
 - Mass crosses the boundary but not the energy
 - Neither mass nor energy crosses the boundaries of the system
 - Both the energy and mass cross the boundaries of the system.
58. The value of $n=1$ in the polytropic process indicates it to be
- Reversible process
 - Isothermal process
 - Adiabatic process
 - Irreversible process
59. Otto cycle consists of the following four processes
- Two isothermal and two isentropic
 - Two isentropic and two constant volume
 - Two isentropic, one constant volume and constant pressure
 - Two isentropic and two constant pressure
60. Resilience of a material is important, when it is subjected to
- Combined loading
 - Fatigue
 - Wear and tear
 - Shock loading
61. Queuing theory is associated with
- Sales
 - Inspection time
 - Production time
 - Waiting time

62. Break-even analysis consists of
- Fixed cost
 - Variable cost
 - Fixed and variable cost
 - Operation cost
63. Which of the following is a fire tube boiler
- Locomotive boiler
 - Babcock and Wilcox boiler
 - Stirling boiler
 - All of the above
64. An economizer is a boiler
- Increase steam pressure
 - Increase steam flow
 - Decrease fuel consumption
 - Decrease steam pressure
65. Which of the following is not a vector quantity
- Weight
 - Velocity
 - Acceleration
 - Force
66. The unit of radio-activity is
- Electron-volt
 - Electron-ampere
 - Curie
 - MeV
67. In a diesel engine, the fuel is ignited by
- Spark
 - Injected fuel
 - Heat resulting from compressing air that is supplied for combustion
 - Ignition
68. The air-fuel ratio of the petrol engine is controlled by
- Fuel pump
 - Governor
 - Injector
 - Carburetor

69. Rain drops are spherical because of
- Viscosity
 - Air resistance
 - Surface tension force
 - Atmospheric pressure
70. The stagnation pressure rise in a centrifugal compressor takes place
- In the diffuser only
 - In the impeller only
 - In the diffuser and impeller
 - In the inlet guide vanes only
71. Discharge of centrifugal pump is
- Directly proportional to diameter of its impeller
 - Inversely proportional to diameter of its impeller
 - Directly proportional to (diameter)² of its impeller
 - Inversely proportional to (diameter)² of its impeller
72. Multi-stage centrifugal pumps are used to
- Give high discharge
 - Produce high head
 - Pump viscous fluid
 - All of the above
73. Hooke's law holds good upto
- Yield point
 - Limit of proportionality
 - Breaking point
 - Elastic limit
74. If equal and opposite forces applied to a body tend to elongate it, the stress so produced is called
- Tensile stress
 - Compressive stress
 - Working stress
 - Internal resistance
75. The ultimate tensile stress of a mild steel material compared to ultimate compressive stress is
- Same
 - More
 - Less
 - More or less depending on other factors

76. Sensible heat is the heat required to
- Change vapor to liquid
 - Change liquid to vapor
 - Increase the temperature of liquid to vapor
 - Convert water into steam and superheat it
77. Forces are called concurrent when their lines of action meet in
- One point
 - Two point
 - Plane
 - Perpendicular planes
78. When trying to turn a key into a lock, following is applied
- Coplanar forces
 - Non-coplanar forces
 - Moment
 - Couple
79. Corrosion resistance in steel is increased by adding
- Chromium and nickel
 - Nickel and molybdenum
 - Aluminum and zinc
 - None of the above
80. The relative coefficient of performance is
- Actual COP/ theoretical COP
 - Theoretical COP/ actual COP
 - Actual COP * theoretical COP
 - Theoretical COP* actual COP