

PGCET-2018

Seat No. _____

SUB: MECHANICAL ENGINEERING (ME)

Time: 1 Hour 30 minutes

Instructions:

1. Ensure that all pages are printed.
2. Use Black ball pen only
3. Change in option is not allowed
4. There is no negative marking
5. Use of non-programmable scientific calculator is allowed

1. In order to determine the effects of a force, acting on a body, we must know
 - A Magnitude of the force
 - B Line of action of the force
 - C Nature of the force
 - D All of the above
2. Concurrent forces are those forces whose lines of action
 - A Lie on the same line
 - B Meet at one point
 - C Meet on the same plane
 - D None of these
3. The unit of moment of inertia of an area is
 - A kg-m^2
 - B kg-m-s^2
 - C kg/m^2
 - D m^4
4. Moment of inertia of a circular section about its diameter(d) is
 - A $d^3/16$
 - B $d^3/32$
 - C $d^4/32$
 - D $d^4/64$
5. The ratio of static friction to dynamic friction is always
 - A equal to one
 - B less than one
 - C greater than one
 - D none of these
6. The bodies which rebound after impact are called
 - A inelastic bodies
 - B elastic bodies
 - C neither elastic nor inelastic bodies
 - D none of these
7. The ratio of linear stress to linear strain is called
 - A modulus of rigidity
 - B modulus of elasticity
 - C bulk modulus
 - D poisson's ratio
8. A bolt is made to pass through a tube and both of them are tightly fitted with help of washers and nuts. If the nut is tightened, then
 - A bolt and tube are under tension
 - B bolt and tube are under compression
 - C bolt is under compression and tube is under tension
 - D bolt is under tension and tube is under compression
9. When a body is subjected to three mutually perpendicular stresses, of equal intensity, the ratio of direct stress to the corresponding volumetric strain is known as
 - A Young's modulus
 - B modulus of rigidity
 - C bulk modulus
 - D Poisson's ratio
10. The extremities of any diameter on Mohr's circle represent
 - A principal stresses
 - B normal stresses on plane at 45°
 - C shear stresses on plane at 45°
 - D normal and shear stresses on a plane
11. The capacity of a strained body for doing work on removal of the straining force, is called
 - A strain energy
 - B resilience
 - C proof resilience
 - D impact energy

12. when there is a sudden increase or decrease in shear force diagram between any two points, it indicates that there is a
- | | |
|---|---|
| A Point load at the two points | B no loading between the two points |
| C uniformly distributed load between the two points | D uniformly varying load between the two points |
13. A spring is used to absorb shocks and vibrations is
- | | |
|------------------|------------------|
| A conical spring | B torsion spring |
| C leaf spring | D disc spring |
14. The object of caulking in a riveted joint is to make the joint
- | | |
|-----------------------|-----------------------|
| A free from corrosion | B stronger in tension |
| C free from stresses | D leak-proof |
15. The buckling load for a given column depends upon
- | | |
|--|---|
| A area of cross-section of the column | B length and least radius of gyration of the column |
| C modulus of elasticity for the material of the column | D all of the above |
16. The columns whose slenderness ratio is less than 80, are known as
- | | |
|-----------------|------------------|
| A short columns | B long columns |
| C weak columns | D medium columns |
17. The property of liquid which offers resistance to the movement of one layer of liquid over another adjacent layer of liquid, is called
- | | |
|-------------------|-------------------|
| A surface tension | B compressibility |
| C capillarity | D viscosity |
18. The pressure measured with the help of the pressure gauge is called
- | | |
|------------------------|------------------|
| A atmospheric pressure | B gauge pressure |
| C absolute pressure | D mean pressure |
19. The centre of gravity of the volume of the liquid displaced is called
- | | |
|----------------------|----------------------|
| A centre of pressure | B centre of buoyancy |
| C metacentre | D none of these |
20. A flow in which each liquid particle has a definite path, and the paths of individual particles do not cross each other, is called
- | | |
|-------------------|------------------|
| A steady flow | B uniform flow |
| C streamline flow | D turbulent flow |
21. For a perfect incompressible liquid, flowing in a continuous stream, the total energy of a particle remains the same, while the particle moves from one point to another. This statement is called
- | | |
|-----------------------|-------------------------|
| A continuity equation | B Bernoulli's equation |
| C Pascal's law | D Archimede's principle |
22. A pitot tube is used to measure the
- | | |
|--|--|
| A velocity of the flow at the required point in pipe | B pressure difference between two points in a pipe |
| C total pressure of liquid flowing in a pipe | D discharge through a pipe |
23. A pipe of length more than double the diameter of orifice fitted externally or internally to the orifice is called a
- | | |
|--------------|----------|
| A notch | B weir |
| C mouthpiece | D Nozzle |

24. The hydraulic mean depth or the hydraulic radius is the ratio of
 A area of flow and wetted perimeter B wetted perimeter and diameter of pipe
 C velocity of flow and area of flow D none of these
25. The magnitude of water hammer depends upon the
 A elastic properties of the pipe material B elastic properties of liquid flowing through the pipe
 C speed at which the valve is closed D all of the above
26. Bulk modulus of a fluid is the ratio of
 A shear stress to shear strain B increase in volume to the viscosity of fluid
 C increase in pressure to the volumetric strain D critical velocity to the viscosity of fluid
27. A flow is called sub-sonic, if the Mach number is
 A less than unity B unity
 C between 1 and 6 D more than 6
28. The ratio of the inertia force to the viscous force is called
 A Reynold's number B Froude's number
 C weber's number D Euler's number
29. An impulse turbine is used for
 A low head of water B high head of water
 C medium head of water D high discharge
30. A pelton wheel develops 1750kW under a head of 100 meters while running at 200 r.p.m. and discharging 2500 litres of water per second. The unit power of the wheel is
 A 0.25 kW B 0.75kW
 C 1.75 kW D 3.75 kW
31. Which of the following turbine is preferred for 0 to 25 m head of water?
 A Pelton wheel B Kalpan turbine
 C Francis turbine D none of these
32. A centrifugal pump will start delivering liquid only when the pressure rise in the impeller is equal to the
 A kinetic head B velocity head
 C manometric head D static head
33. First law of thermodynamics deals with
 A conservation of heat B conservation of momentum
 C conservation of mass D conservation of energy
34. The behavior of a perfect gas, undergoing any change in the variables which control physical properties, is governed by
 A Boyle's law B Charles's law
 C Gay-Lussac law D all of these
35. The absolute zero pressure will be
 A when molecular momentum of the system becomes zero B at sea level
 C at the temperature of -273K D at the centre of the earth
36. The sum of internal energy (U) and the product of pressure and volume (p.v) is known as
 A workdone B entropy
 C enthalpy D none of these

37. A process, in which the gas is heated or expanded in such a way that the product of its pressure and volume remains constant, is called
 A isothermal process B hyperbolic process
 C adiabatic process D polytropic process
38. The compression ratio for diesel engine is
 A 3 to 6 B 5 to 8
 C 15 to 20 D 20 to 30
39. The gas in cooling chamber of a closed cycle gas turbine is cooled at
 A constant volume B constant temperature
 C constant pressure D none of these
40. Which of following has the highest calorific value?
 A Peat B Lignite
 C Bituminous coal D Anthracite coal
41. Water tube boilers are
 A internally fired B externally fired
 C internally as well as externally fired D none of these
42. The forced circulation of water does not take place in
 A La-Mont boiler B Lancashire boiler
 C Velox boiler D Benson boiler
43. A safety valve usually employed with stationary boilers is
 A lever safety valve B dead weight safety valve
 C high steam and low water safety valve D all of these
44. A condenser where circulating water flows through tubes which are surrounded by steam, is known as
 A surface condenser B jet condenser
 C barometric condenser D evaporative condenser
45. The critical pressure gives the velocity of steam at the throat
 A equal to the velocity of sound B less than velocity of sound
 C more than the velocity of sound D none of these
46. The difference of supersaturated temperature and saturation temperature at that pressure is called
 A degree of supersaturation B degree of superheat
 C degree of undercooling D none of these
47. The expansion of steam, as it flows over the blades in reaction turbine, represents
 A isothermal process B isentropic process
 C throttling process D free-expansion process
48. Multi-stage steam turbines are of the
 A velocity compounded type B reaction type
 C pressure compounded type D all of these
49. The compression ignition engines are governed by
 A hit and miss governing B qualitative governing
 C quantitative governing D combination of (B) and (C)
50. The knocking in spark ignition engines can be reduced by
 A retarding the spark B increasing the engine speed
 C both (A) and (B) D none of these
51. The octane number of petrol, generally available, is
 A 20 to 40 B 40 to 60
 C 40 to 60 D 80 to 100

52. A large clearance volume in a reciprocating compressor results in
 A reduced volume flow rate B increased volume flow rate
 C lower suction pressure D lower delivery pressure
53. The stagnation pressure rise in a centrifugal compressor takes place
 A in the diffuser only B in the impeller only
 C in the diffuser and impeller D in the inlet guide vanes only
54. In a jet propulsion unit, the products of combustion after passing through the gas turbine are discharged into
 A atmosphere B vacuum
 C discharge nozzle D back to the compressor
55. The heat transfer from a hot body to a cold body is directly proportional to the surface area and difference of temperature between the two bodies. This statement is called
 A First law of thermodynamics B Newton's law of cooling
 C Newton's law of heating D Stefan's law
56. The critical radius is the insulation radius at which the resistance to heat flow is
 A maximum B minimum
 C zero D none of these
57. The automobile radiator is a heat exchanger of
 A parallel flow type B counter flow type
 C cross flow type D regenerator type
58. Fouling factor is used
 A in heat exchanger design as safety factor B in case of Newtonian fluids
 C when liquid exchanges heat with a gas D none of the above
59. The ratio of surface convection resistance to the internal conduction resistance is known as
 A Grashoff number B Biot number
 C Stanton number D Prandtl number
60. The ratio of Nusselt number and the product of Reynold's number and prandtl number is equal to
 A Stanton number B Biot number
 C Peclet number D Grashoff number
61. A boot-strap cooling system has
 A one heat exchanger B two heat exchangers.
 C three heat exchangers D four heat exchangers
62. The ratio of the maximum displacement of the forced vibration to the deflection due to the static force, is known as
 A damping factor B damping coefficient
 C logarithmic decrement D magnification factor
63. The factor which affects the critical speed of a shaft is
 A diameter of disc B span of shaft
 C eccentricity D all of these
64. A Hartnell governor is a
 A dead weight governor B pendulum type governor
 C spring loaded governor D inertia governor
65. The radial distance of a tooth from the pitch circle to the bottom of the tooth is called
 A dedendum B addendum
 C clearance D working depth

66. Which of the following is an antifriction bearing?
 A journal bearing B pedestal bearing
 C collar bearing D needle bearing
67. A key made from a cylindrical disc having segmental cross-section, is known as
 A feather key B gib-head key
 C wood ruff key D flat saddle key
68. The percentage of carbon in cast iron varies from
 A 0.1 to 0.5 B 0.5 to 1
 C 1 to 1.7 D 1.7 to 4.5
69. Micro-structure of material is, generally, examined by
 A naked eye B optical microscope
 C X-ray technique D none of these
70. Which of the following welding process uses non-consumable electrodes?
 A TIG welding B MIG welding
 C Manual arc welding D Submerged arc welding
71. In arc welding, the temperature of heat produced by the electric arc is of the order of
 A 3000°C to 4000°C B 4000°C to 5000°C
 C 5000°C to 6000°C D 6000°C to 7000°C
72. The operation of cutting a cylindrical hole in a sheet of metal by the punch and die is called
 A shearing B piercing
 C punching D blanking
73. Dielectric is used in
 A electro-chemical machining B ultra-sonic machining
 C electro-discharge machining D laser machining
74. A drill considered as a cutting tool having zero rake, is known as a
 A flat drill B straight fluted drill
 C parallel shank twist drill D tapered shank twist drill
75. Lathe bed is made of
 A mild steel B alloy steel
 C pig iron D chilled cast iron
76. CPM stands for
 A Combined Process Method B Critical Path Method
 C Common Planning Method D Critical Process Method
77. Quenching theory is used for
 A job-shop scheduling B inventory problems
 C traffic congestion studies D all of these
78. The starter motor is driven by
 A chain drive B gear drive
 C flat belt drive D V-belt drive
79. The condition that results in large quantities of CO emission is
 A insufficient air during combustion B insufficient fuel during combustion
 C low temperature combustion D high temperature combustion
80. The process of removing the burnt gases from the engine cylinder by fresh charge coming into the engine cylinder from the crank-case, is known as
 A cleaning B priming
 C scavenging D Detonation

81. Let $f(x) = |x|$, $-2 \leq x \leq 2$; then
- A $f(x)$ is not continuous at $x=0$ and hence not differentiable
- B $f(x)$ is continuous at $x=0$ but not differentiable at $x=0$
- C $f(x)$ is continuous throughout but not differentiable at $x=1$
- D $f(x)$ is continuous and differentiable everywhere
82. The general solution of the differential equation $(D^2 - 2)^2 y = 0$ is
- A $y = (c_1 + c_2 x)e^{\sqrt{2}x} + (c_3 + c_4 x)e^{-\sqrt{2}x}$
- B $y = c_1 e^{\sqrt{2}x} + c_2 e^{\sqrt{2}x} + c_3 e^{-\sqrt{2}x} + c_4 e^{-\sqrt{2}x}$
- C $y = c_1 e^{\sqrt{2}x} + c_2 e^{-\sqrt{2}x}$
- D $y = (c_1 + c_2 x + c_3 x^2 + c_4 x^3)e^{\sqrt{2}x}$
83. The value of the integral $\oint_C \frac{\cos z}{z - \pi} dz$, $C : |z - 1| = 3$ is
- A πi
- B $2\pi i$
- C $-\pi i$
- D $-2\pi i$
84. The approximate value of y at $x=0.2$ using Euler's method for the differential equation $\frac{dy}{dx} = x + y$, $y(0) = 1$, $h = 0.1$ is
- A 1.2
- B 1.36
- C 1.1
- D 1.22
85. Which of the following is TRUE for the matrices?
- A $|A \cdot B| = |A| \cdot |B|$
- B $(A \cdot B)^{-1} = A^{-1} \cdot B^{-1}$
- C $|A + B| = |A| + |B|$
- D $(A + B)^T \neq A^T + B^T$
86. In rolling two fair dice, the probability of getting equal number or numbers with an even product is
- A 6/36
- B 27/36
- C 30/36
- D 3/36
87. In Simpson's 1/3 rule, interval of integration is divided into subintervals. Number of these subintervals should be
- A Odd
- B Even
- C Multiple of 3
- D None of these

88. The integrating factor of the differential equation $\frac{dy}{dx} + \frac{x}{1+x}y = 1+x$ is
- A e^x B $e^x(1+x)$
- C $\frac{e^x}{1+x}$ D $e^{x+x^2/2}$
89. A necessary and sufficient condition that line integral $\oint_C \vec{A} \cdot \vec{dr} = 0$ for every closed curve C is that
- A $\text{div } \vec{A} = 0$ B $\text{curl } \vec{A} = 0$
- C $\text{div } \vec{A} \neq 0$ D $\text{curl } \vec{A} \neq 0$
90. If $u = x^3 e^{\frac{-x}{y}}$ then $x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2}$ is
- A $3u$ B $9u$
- C $6u$ D $-u$
91. The value of $\int_C (y^2 dx + x^2 dy)$ where C is the boundary of the square $-1 \leq x \leq 1, -1 \leq y \leq 1$
- A 0 B 4
- C $2(x+y)$ D $4/3$
92. The function $2x - x^2 + py^2$ is harmonic if p equals to
- A 3 B 0
- C 1 D 2
93. The pair of linear equations $kx + 3y + 1 = 0, 2x + y + 3 = 0$ has exactly one solution if
- A $k = 6$ B k has any value
- C $k \neq 6$ D None of these
94. Minimum value of $x^2 + y^2 + 6x + 14$ is
- A 5 B 14
- C 0 D -3

95. The Newton-Raphson formula for finding the square root of a real number R from the equation $x^2 - R = 0$ is

A

$$x_{i+1} = \frac{x_i}{2}$$

B

$$x_{i+1} = \frac{1}{2} \left(x_i + \frac{R}{x_i} \right)$$

C

$$x_{i+1} = \frac{3x_i}{2}$$

D

$$x_{i+1} = \frac{1}{2} \left(3x_i - \frac{R}{x_i} \right)$$

96.

$$L \left(\frac{1}{\sqrt{t}} \right) \text{ is}$$

A

$$\frac{\pi}{\sqrt{s}}$$

B

$$\frac{\sqrt{\pi}}{s}$$

C

$$\sqrt{\frac{\pi}{s}}$$

D

$$\frac{1}{\sqrt{2S}}$$

97.

The solution of the differential equation $x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} = 0$ is

A

$$y = c_1 + c_2 \log x$$

B

$$y = c_1 \log x$$

C

$$y = c_1 + c_2 x$$

D

$$y = (c_1 + c_2 x) e^x$$

98. If A and B are independent events, then which of the following is FALSE?

A

$$P(A/B) = P(A)$$

B

$$P(A \cap B) = P(A)P(B)$$

C

$$P(B/A) = P(B)$$

D

None of these

99.

$$L^{-1} \log \left(\frac{s+b}{s+a} \right) \text{ is}$$

A

$$\frac{e^{-at} - e^{-bt}}{t}$$

B

$$\frac{e^{-bt} - e^{-at}}{t}$$

C

$$\frac{e^{at} - e^{bt}}{t}$$

D

$$\frac{e^{bt} - e^{at}}{t}$$

100.

A 3×3 matrix has eigen values 1, 0, 2. Which is TRUE of the following?

A Trace of A = 0

B A^{-1} does not exist

C A is not diagonalizable

D None of these