

B

23022

120 MINUTES

1. The indentation mark made on the top of the brick to provide key for holding the mortar is known as:
A) Frog B) Pallet C) Strike D) Valley
2. In a Vicat's apparatus the attachment used for consistency test is:
A) Square needle B) Plunger
C) Needle with annular collar D) None of these
3. For ordinary cement the final setting time should be about:
A) 30 minutes B) 1 hour C) 10 hours D) 24 hours
4. Warp in timber is a defect due to:
A) Fungi B) Seasoning C) Insects D) Conversion
5. Formation of grey or white deposits on the surface of bricks due to presence of excess salts is called:
A) Efflorescence B) Disintegration
C) Warping D) Floating
6. The vertical sides of openings of doors and windows are:
A) Jambs B) Reveals C) Buttresses D) Pilasters
7. The covering on the exposed top of a wall:
A) Cornice B) Corbel C) Coping D) Cramp
8. The tool used by masons to check the verticality of walls:
A) Square B) Spirit level C) Nicker D) Plumb bob
9. Dry Rubble masonry is the Rubble masonry in which:
A) Stones are dry B) Mortar is dry
C) Mortar is not used D) None of these
10. The portion of a brick obtained by cutting the brick lengthwise into two portions is called:
A) Queen closer B) King closer
C) Bevelled closer D) Mitred closer
11. Indirect ranging is adopted when the two ends of the chain line are:
A) Very near to each other B) Not intervisible
C) Intervisible D) None of these

12. The bearing of a line measured in the clockwise direction from magnetic north is called ---- bearing.
A) Reduced B) Whole circle C) Quadrantal D) Fore
13. A bench mark is:
A) Very first station
B) Reference point whose elevation is known
C) The last station where survey closes
D) None of these
14. The first staff reading taken after setting up the leveling instrument is:
A) Fore sight B) Intermediate sight
C) Back sight D) None of these
15. Contour lines will cross each other in case of:
A) An overhanging cliff B) A steep hill
C) A deep valley D) Pond
16. Output of the compiler is:
A) Object code B) High level code
C) Both (A) and (B) D) None of these
17. Role of the lexical analyzer is:
A) Divide the program into tokens
B) Remove comment lines
C) Remove whitespaces
D) All of these
18. Average time complexity of bubble sort is:
A) $O(n \log n)$ B) $O(n)$
C) $O(1)$ D) None of these
19. What will be the output of the following code?
main ()
{
int a=20, c;
float b=3;
c=a/b;
printf ("%d", c);
}
- A) 6 B) 6.6 C) 6.0 D) 0.66

25. What will be the output of the following code?

```
int main( )
{
char string1[ ] = "HELLO" ;
char string2[ ] = "HELLO" ;
int j;

j = strcmp( string1, string2 ) ;

printf( "%d\n", j ) ;
return 0 ;
}
```

- A) -1
- B) 1
- C) 0
- D) None of these

26. What will be the output of the following code?

```
void main( )
{
printf( 3 + "C PROGRAMMING " ) ;
return 0 ;
}
```

- A) ROGRAMMING
- B) C PROGRAMMING
- C) OGRAMMING
- D) GRAMMING

27. The function used to open the file:

- A) fclose()
- B) fread()
- C) fwrite()
- D) None of these

28. The function used to read the file's contents from memory:

- A) fgetc()
- B) fputc()
- C) printf()
- D) scanf()

29. The parameter passing mechanism used in C language:

- A) Call by value
- B) Call by reference
- C) Both (A) and (B)
- D) None of these

30. What will be the output of the following code?

```
void main( )
{
int i;
for(i = 0; i<3; i++);
printf("%d", i);
}
```

- A) 0,1,2
- B) 3
- C) Compilation error
- D) 4

31. The value of λ for which the system of equations $\lambda x - 4y = 6$; $4x + y = 2$; $3x - y = 5$ consistent is:
 A) -2 B) 2 C) -4 D) 0
32. The limit of the function $f(x, y) = \frac{2xy^2}{x^2+y^4}$ as $(x, y) \rightarrow (0,0)$ is:
 A) 0 B) infinite C) 2 D) Does not exist
33. Consider the function $f(x, y) = \log\left(\frac{1+x}{1-2y}\right)$. In which of the following region $f(x, y)$ is continuous?
 A) $\{(x, y) : x + 2y > 0\}$ B) $\{(x, y) : x + 2y < 0\}$
 C) $\{(x, y) : y \neq \frac{1}{2}\}$ D) $\{(x, y) : y \leq \frac{1}{2}\}$
34. Consider the initial value problem $\frac{dy}{dx} = y^2, y(0) = 1$. In which of the following intervals unique solution exists?
 A) $(-\infty, 1)$ B) $(1, \infty)$ C) $(0, \infty)$ D) $(-\infty, \infty)$
35. The value of x for which the rank of the matrix $A = \begin{bmatrix} 2 & 1 & 2 \\ 1 & 1 & 1 \\ 2 & 0 & x \end{bmatrix}$ less than 3 is:
 A) -2 B) 2 C) 1 D) -1
36. The value of integral $\iint_R x dx dy$ in the region bounded by the lines $x = 0$; $y = 0$ and $x + y = 1$ is:
 A) 0 B) $\frac{1}{6}$ C) $\frac{1}{3}$ D) 1
37. The particular integral of the differential equation $x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx} - 6y = x$
 A) $\frac{1}{5}e^x$ B) $-\frac{1}{5}x$ C) $-\frac{1}{5}e^x$ D) $\frac{1}{5}x$
38. Which of the following is an eigen vector corresponding to an eigen value of the matrix $A = \begin{bmatrix} 4 & -5 \\ 1 & -2 \end{bmatrix}$ is:
 A) $\begin{pmatrix} 1 \\ 5 \end{pmatrix}$ B) $\begin{pmatrix} 5 \\ -1 \end{pmatrix}$ C) $\begin{pmatrix} -1 \\ 5 \end{pmatrix}$ D) $\begin{pmatrix} 5 \\ 1 \end{pmatrix}$

39. The general solution of the differential equation $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 13y = 0$ is:
- A) $e^{-2x}(A \cos 3x + B \sin 3x)$
 B) $e^{-3x}(A \cos 2x + B \sin 2x)$
 C) $e^{2x}(A \cos 3x + B \sin 3x)$
 D) $e^{3x}(A \cos 2x + B \sin 2x)$
40. Suppose $\omega = \sqrt{x^2 + y^2}$; $x = \cos \theta$; $y = \sin \theta$. The value of $\frac{d\omega}{d\theta}$ at $\theta = \frac{\pi}{2}$ is:
- A) 1 B) 0 C) -1 D) 2
41. The critical point of $f(x, y) = x^2 + xy - y^2 - 4x + 3y - 1$ is:
- A) (2, 1) B) (-1, 2) C) (1, 3) D) (1, 2)
42. The middle term in the Taylor series expansion of $\left(2x - \frac{1}{3x^2}\right)^6$ is:
- A) $-\frac{40}{9x^3}$ B) $\frac{40}{9x^3}$ C) $-\frac{10}{9x^3}$ D) $\frac{40x^3}{9}$
43. A particle moves along the curve whose parametric equations are given by $x = t^2 - 1$, $y = 2t$ and $z = t^2 - 1$, where t denotes the time. The acceleration at $t = 1$ is:
- A) $2\hat{i} + 2\hat{j} + 2\hat{k}$ B) $\hat{i} - 2\hat{j} + 2\hat{k}$
 C) $2\hat{i} + 2\hat{j}$ D) $2\hat{i} + 2\hat{k}$
44. The particular solution of the differential equation $\frac{d^2y}{dx^2} - y = e^x \sin x$ is:
- A) $-\frac{e^x(2 \cos x - \sin x)}{5}$ B) $\frac{e^x(2 \cos x + \sin x)}{5}$
 C) $\frac{e^x(2 \cos x - \sin x)}{5}$ D) $-\frac{e^x(2 \cos x + \sin x)}{5}$
45. The unit tangent vector at the point $\left(0, 2, \frac{\pi}{2}\right)$ on the curve $\vec{r} = 2 \cos \theta \hat{i} + 2 \sin \theta \hat{j} + 2\theta \hat{k}$ is:
- A) $\frac{-\hat{i} + \hat{k}}{\sqrt{2}}$ B) $\frac{\hat{i} + \hat{k}}{\sqrt{2}}$ C) $\frac{\hat{i} - \hat{k}}{\sqrt{2}}$ D) $\frac{\hat{i} + \hat{j} + \hat{k}}{\sqrt{3}}$
46. The series $\sum_{n=1}^{\infty} \frac{1}{(n+2)(n+3)}$ is:
- A) Divergent B) Converges to $\frac{1}{3}$
 C) Converges to 0 D) Converges to $\frac{1}{4}$

47. Laplace transform of $\sin^2 3t$ is:
- A) $\frac{18}{s(s^2-36)}$ B) $\frac{18}{s(s^2+36)}$ C) $\frac{12}{s(s^2-36)}$ D) $\frac{24}{s(s^2+36)}$
48. If $\vec{A} = 2t^2\hat{i} + (t^2 + 1)\hat{j} + t\hat{k}$ and $\vec{B} = t\hat{i} + t^2\hat{j} + \hat{k}$, the modulus of $\frac{d}{dt}(\vec{A} \times \vec{B})$ at $t = 0$ is:
- A) 1 B) $\sqrt{2}$ C) 0 D) $\frac{1}{\sqrt{2}}$
49. If $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$, then $\text{grad } |\vec{r}|$, where $r = |\vec{r}|$ is:
- A) $\frac{\vec{r}}{r}$ B) \vec{r} C) $\frac{\vec{r}}{r^2}$ D) $-\frac{\vec{r}}{2r^2}$
50. Which of the following is **not** true?
- A) $\text{curl}(\vec{A} + \vec{B}) = \text{curl } \vec{A} + \text{curl } \vec{B}$
 B) $\text{div}(\vec{A} + \vec{B}) = \text{div } \vec{A} \times \text{div } \vec{B}$
 C) $\text{curl}(\phi\vec{A}) = (\text{grad}\phi) \times \vec{A} + \phi\text{curl } \vec{A}$
 D) $\text{curl}(\text{grad}\phi) = 0$
51. Which of the following chucks in the lathe machine is known as universal chuck?
- A) Magnetic chuck B) Face plate
 C) Three jaws chuck D) Fair jaws chuck
52. Which of the following is **not** liquid based Rapid prototyping system?
- A) Stereo lithography apparatus
 B) Laminated object manufacturing
 C) Solid Ground wiring
 D) Solid- object ultra violet laser printer
53. Which of this joining process is associated with welding of base metals?
- A) Explosion welding B) Soldering
 C) Brazing D) Thermit welding
54. The extrusion process used in manufacturing short length components like tooth paste tubes, gun shells etc.:
- A) Indirect extrusion B) Direct extrusion
 C) Hydro static extrusion D) Continuous extrusion
55. Which one of the following is a positive drive?
- A) Crossed belt drive B) Rope drive
 C) V belt drive D) Chain drive

56. Blow holes in casting are caused by:
 A) Excessive moisture B) Low permeability
 C) Excessive fine grain D) None of these
57. What is the temperature at which air can be brought to saturation state adiabatically?
 A) Thermodynamic WBT B) Thermodynamic DBT
 C) Thermodynamic DPT D) DPT
58. Which one of the following is **not** a positive displacement pump?
 A) Reciprocating pump B) Centrifugal pump
 C) Vane pump D) Gear pump
59. If the coefficient of performance of a heat pump is 5, then what is the value of coefficient of performance of the refrigerator operating under same condition?
 A) 0.2 B) 3 C) 4 D) 6
60. Which type of heat system is best suited for low fuel combustion and reduce exhaust emission?
 A) In line pump system B) Rotary pump system
 C) Distributor pump system D) CRDI system
61. Which of the following is **incorrect** regarding assumption of Air standard cycle?
 A) Chemical composition of air does not vary with temperature
 B) Specific heat of working fluid varies with temperature
 C) Heat loss to the surrounding is negligible
 D) Specific heat of working fluid does not vary with temperature
62. Otto cycle is the:
 A) Air standard cycle of CI engine
 B) Air standard cycle of SI engine
 C) Vapour power cycle of CI engine
 D) Vapour power cycle of SI engine
63. Turning, Facing and Parting operations are usually done with the help of a ----.
 A) Drilling machine B) Lathe
 C) Shaper D) Milling machine
64. MPFI stands for:
 A) Multi Phase Fuel Injection
 B) Mixed Phase Fuel Injection
 C) Multi Point Fuel Injection
 D) Mixed Point Fuel Injection

65. What is the major loss in C I engine?
 A) Variation in specific heat and chemical equilibrium
 B) Pumping
 C) Exhaust blow down
 D) Incomplete combustion
66. ---- is an energy dissipating component.
 A) Vacuum diode B) Inductor
 C) Capacitor D) Resistor
67. Tolerance limit of gold band in a resistor is:
 A) $\pm 1\%$ B) $\pm 10\%$ C) $\pm 5\%$ D) $\pm 20\%$
68. Unit of Inductance:
 A) Mho B) Henry C) Farad D) Ohms
69. The internal impedance of ideal voltage source and the load impedance of ideal current source are:
 A) Low and High B) 0 and ∞
 C) ∞ and 0 D) None of these
70. In a constant voltage source, Zener diode is connected in----- condition.
 A) Reverse biased B) Forward biased
 C) Inverted mode D) None of these
71. The resistance offered by a diode, connected in forward biased condition is called:
 A) Dynamic Resistance B) Inverse Resistance
 C) Static Resistance D) Reactance
72. Peak Inverse Voltage (PIV) for a centre tapped and bridged full wave rectifier are ---- and ----.
 A) V_m and $0.5V_m$ B) $2V_m$ and V_m
 C) V_m and $2V_m$ D) V_m and V_m
73. Doping concentration of transistor is:
 A) $E > C > B$ B) $E > C < B$ C) $E < C < B$ D) $E < C > B$
74. The biased condition of a transistor to operate it in inverse mode are EB Junction ----- and CB Junction ----- .
 A) Reverse biased, Forward biased
 B) Reverse biased, Reverse biased
 C) Forward biased, Forward biased
 D) Forward biased, Reverse biased

75. To work transistor as an amplifier, the Q-Point is fixed at -----.
- Cut-off region of DC Load Line
 - Saturation region of DC Load Line
 - Midpoint of DC Load Line
 - None of these
76. Most widely used biasing circuit which makes Q-Point independent of β is called:
- Voltage divider bias circuit
 - Fixed bias circuit
 - Biasing circuit with Emitter resistor
 - Collector to base bias circuit
77. Efficiency and Ripple factor of full wave rectifier are:
- 81.2% and 1.21
 - 40.6% and 0.482
 - 40.6% and 1.21
 - 81.2% and 0.482
78. In ----- the amplitude of carrier wave is varied with that of the modulating signal.
- Phase Modulation
 - Frequency Modulation
 - Amplitude Modulation
 - PSK Modulation
79. In phase modulation, phase deviation is:
- Independent of both amplitude and frequency
 - Proportional to both amplitude and frequency
 - Independent of the amplitude and proportional to its frequency
 - Proportional to the amplitude and independent of its frequency
80. Maximum efficiency is attained when the shape of the cell is:
- Hexagonal
 - Rectangular
 - Circular
 - None of these
81. Power absorbed in a purely inductive circuit is:
- Zero
 - Maximum
 - Infinite
 - Normal
82. The capacitive reactance of a circuit is ----- frequency.
- Independent of
 - Inversely proportional to
 - Directly proportional to
 - None of these
83. An alternating voltage is given by $v = 100 \sin 314 t$. Its average value will be:
- 70.7 V
 - 50 V
 - 63.7 V
 - 100 V
84. Electrical appliances are connected in parallel because it -----.
- Is simple circuit
 - Draws less current
 - Makes the operation of appliances independent of each other
 - None of these

85. Kirchhoff's current law is applicable to only:
 A) Closed loops in a network B) Electronics circuits
 C) Electric circuits D) Junctions in a network
86. One kWh of electrical energy equals nearly:
 A) 735.5 W B) 860 kcal C) 3600W D) 4186J
87. Unit of magnetic flux is:
 A) Weber B) AT/m C) Tesla D) Henry
88. Relative permeability of vacuum is:
 A) $4\pi \times 10^{-7} H/m$ B) $\frac{1}{4} H/m$
 C) 1 D) 0
89. The direction of induced emf can be found out by using:
 A) KCL B) Faraday's Law
 C) KVL D) Lenz's Law
90. The power in an ac circuit is given by:
 A) $VI \cos\phi$ B) $VI \sin\phi$ C) I^2Z D) I^2X_L
91. The power factor of an R-C circuit is:
 A) Always zero B) Between zero and 1
 C) Always unity D) Between zero and -1
92. In a delta-connected system, the relation between the line voltage V_L and phase voltage V_{ph} is:
 A) $V_L = \sqrt{3} V_{ph}$ B) $V_L = V_{ph}/\sqrt{3}$
 C) $V_L = V_{ph}$ D) None of these
93. The Peak factor of a sinusoidal wave is:
 A) 1.414 B) 1.11 C) 2 D) 1.5
94. The expression for energy stored in an inductor is given by:
 A) $\frac{LI^2}{2}$ B) $\frac{LI}{2}$ C) LI^2 D) LI
95. The value of coefficient of coupling (k) is zero for:
 A) Perfectly magnetic coupled coils
 B) Magnetically isolated coils
 C) Ideal magnetic coil
 D) None of these

Questions 96-100. Read the passage and choose the most appropriate answer from the options provided.

Dogs can help identify physical illnesses. Although it's still not well understood, their uncanny sense of smell has enabled them to perform feats like sniffing out breast cancer in people's breath or bladder cancer in their urine. Dogs are in widespread use today in airports as a cost-effective way to find hidden drugs and bomb residue.

96. Some dogs can assist as -----.
- A) oncologists B) surgeons
C) diagnosticians D) therapists
97. Their sense of smell is *uncanny*. The word 'uncanny' means:
- A) untaught B) crazy C) mysterious D) untrained
98. To 'sniff out' means to use the sense of smell to-----something.
- A) discover B) recover C) restore D) respire
99. Dogs are employed at airports to help ----- smugglers and terrorists.
- A) defend B) comprehend C) apprehend D) offend
100. It is ----- expensive to use a dog for this purpose at an airport than a human being.
- A) less B) more C) equally D) least

Questions 101 & 102. Fill in the blanks, choosing the most appropriate of the options provided:

101. 'Let's begin-----?'
- A) will we B) shall we C) at all D) at now
102. I need ----- furniture for my office.
- A) a lot B) a few C) some D) many
103. 'I'm looking forward to the trip.' The phrase 'looking forward' suggests:
- A) Exception B) Excursion C) Anticipation D) Precision
104. Pick the part of the sentence that contains an adjective, or pick D to indicate there is no adjective in the sentence:
- Jagan is quite tall for his age.
- A) B) C) D) (No adjective)
105. Pick the wrongly spelt word:
- A) strength B) straitjacket C) sapphire D) successive

106. Elasticity of a body is:
 A) The property by which a body returns to its original shape after the removal of load
 B) The ratio of stress to strain
 C) The resistance to the force acting
 D) Large deformability
107. "If three coplanar forces acting at a point be in equilibrium, then each force is proportional to the sine of the angle between the other two". This statement is as per:
 A) Condition of equilibrium B) Lami's theorem
 C) Law of moments D) Varignon's theorem
108. Poisson's ratio is:
 A) Ratio of load to area B) Ratio of strain to length
 C) Ratio of stress to strain D) Ratio of lateral strain to longitudinal strain
109. A principal plane is a plane which:
 A) Carries only normal stress and no shear stress
 B) Carries maximum shear stress
 C) Has an inclination of 45° to x-axis
 D) Is parallel to x-axis
110. Which of the following is a scalar quantity?
 A) Energy B) Momentum C) Torque D) Impulse
111. Isotropic means:
 A) Having same elastic properties in all directions
 B) Has Young's modulus equal to Modulus of Rigidity
 C) Obeys Hooke's law upto failure
 D) Very strong and durable
112. The component of a force P at right angles to its direction will be:
 A) Zero B) Half C) Same D) $1.414 P$
113. The forces which meet at a point are known as:
 A) Collinear forces B) Concurrent forces
 C) Coplanar forces D) None of these
114. The centroid of a right angled triangle of height h is at a height of----- from base.
 A) $h/4$ B) $h/2$ C) $h/3$ D) $2h/3$

115. Angle of repose is:
A) Less than angle of friction
B) Equal to angle of friction
C) More than angle of friction
D) None of these
116. The number of oscillations per second is known as:
A) Time period
B) Phase Difference
C) Frequency
D) Amplitude
117. The period of oscillation of a simple pendulum depends upon:
A) Mass of the bob
B) Diameter of the bob
C) Density of the string
D) Length of the pendulum
118. In terms of work, Power is defined as:
A) Quantity of work
B) Rate of doing work
C) Capacity of doing work
D) Rate of change of doing work
119. The sum of kinetic energy and potential energy of a falling body:
A) Varies from point to point
B) Is constant at all points
C) Is maximum at start and then will decrease
D) Is minimum at start and then will increase
120. The locus of all instantaneous centres of rotation is called:
A) Moment of inertia
B) Centrode
C) Centre of gravity
D) Centre of pressure
-

1. The system of linear equations $x + y + z = 0$; $2x + y + z = 0$; $x + y + kz = 0$ has non trivial solution if:
- A) $k = 1$ B) $k = -1$ C) $k = 2$ D) $k = -2$
2. The rank of the matrix $\begin{bmatrix} 1 & 3 & 4 \\ 2 & 4 & 7 \\ 1 & 1 & 3 \end{bmatrix}$ is:
- A) 1 B) 3
C) 2 D) None of these
3. The eigen vector corresponding to the eigen value $\lambda = 1$ for the matrix $A = \begin{bmatrix} 2 & -1 \\ -2 & 3 \end{bmatrix}$ is:
- A) $\begin{pmatrix} 1 \\ 1 \end{pmatrix}$ B) $\begin{pmatrix} 1 \\ -2 \end{pmatrix}$ C) $\begin{pmatrix} 2 \\ 1 \end{pmatrix}$ D) $\begin{pmatrix} -1 \\ 1 \end{pmatrix}$
4. The quadratic form $q(X)$ that corresponds to the symmetric matrix $A = \begin{pmatrix} 5 & -3 \\ -3 & 7 \end{pmatrix}$ is:
- A) $5x^2 - 3xy + 7y^2$ B) $5x^2 - 6xy - 7y^2$
C) $5x^2 - 6xy + 7y^2$ D) $5x^2 + 6xy + 7y^2$
5. Consider the function $f(x, y) = \frac{x^3y^2}{1-xy}$. Then which of the following is true?
- A) $f(x, y)$ is continuous every where
B) $f(x, y)$ is continuous only at $(0, 0)$
C) $f(x, y)$ is nowhere continuous
D) None of these
6. If $f(x, y) = x^2y^3 + x^4y$, then $\frac{\partial^2 f}{\partial x^2}$ is:
- A) $2y^3 + 12x^2y$ B) $6x^2y$
C) $2xy^3 + 4x^2y$ D) $6xy^2 + 4x^3$

7. The value of integral $\int_0^1 \int_{-3}^2 y^2 x dx dy$ is:
 A) $\frac{5}{6}$ B) $\frac{-1}{2}$ C) $\frac{-5}{6}$ D) $\frac{1}{2}$
8. The area of the region enclosed by the curve $r = \sin 3\theta$ is:
 A) $\frac{\pi}{4}$ B) $\frac{\pi}{6}$ C) $\frac{\pi}{2}$ D) $\frac{\pi}{3}$
9. The series $\sum_{n=1}^{\infty} \frac{n+2}{n^p}$ converges only for:
 A) $p \geq 2$ B) $p < 2$ C) $p > 2$ D) $p \leq 2$
10. The power series expansion of $\frac{1}{(1+x)(2+x)(3-2x)}$ valid in the domain:
 A) $|x| < 1$ B) $|x| > 1$ C) $|x| > 2$ D) $|x| < 2$
11. The coefficient of $(x - 1)^{15}$ in the Taylor series expansion of $\frac{1}{x}$ about $x = 1$ is:
 A) $-\frac{1}{2^{15}}$ B) $\frac{1}{2^{15}}$ C) $\frac{1}{2^{16}}$ D) $-\frac{1}{2^{16}}$
12. The constant term in the fourier series expansion of $x - x^2$ in $-\pi < x < \pi$ is:
 A) $\frac{2}{3}\pi^2$ B) $-\frac{2}{3}\pi^2$ C) $\frac{1}{3}\pi^2$ D) $-\frac{1}{3}\pi^2$
13. Suppose a particle moves along the curve $\vec{r} = (t^2 - t)\hat{i} + (t^2 + t)\hat{j} + t\hat{k}$ where t denotes the time. The magnitude of the acceleration at $t = 1$ is:
 A) 2 B) 3 C) $\sqrt{11}$ D) $2\sqrt{2}$
14. The directional derivative of $f(x, y, z) = \frac{x}{y+z}$ at the point $(1, 1, 1)$ in the direction of negative y-axis is:
 A) $-\frac{1}{2}$ B) $\frac{1}{2}$ C) $\frac{1}{4}$ D) $-\frac{1}{4}$
15. If F is a vector field and ϕ a scalar function then which of the following is true?
 A) $\text{curl}(\phi F) = \phi \text{curl} F + F \times \nabla\phi$
 B) $\text{curl}(\phi F) = \phi \text{curl} F + \nabla\phi \times F$
 C) $\text{div}(\text{curl} F) = F$
 D) $\text{div}(\phi F) = \phi \text{div} F$

16. A particle is moving along the curve $x = e^{-2t}$, $y = 3 \cos 2t$, $z = 3 \sin 2t$ where t is the time. The magnitude of the initial velocity is:
- A) $2\sqrt{3}$ B) $2\sqrt{5}$ C) $2\sqrt{10}$ D) 0
17. The particular integral of the differential equation $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = e^{5x}$
- A) $\frac{e^{5x}}{4}$ B) $\frac{e^{2x}}{12}$ C) $\frac{e^{5x}}{8}$ D) $\frac{e^{5x}}{12}$
18. Which of the following differential equation is linear?
- A) $y \frac{d^2y}{dx^2} + \frac{dy}{dx} = 2x$ B) $x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx} = e^x$
- C) $2 \frac{d^2y}{dx^2} - 4 \left(\frac{dy}{dx}\right)^2 + 6y = 0$ D) None of these
19. Laplace transform of $t^3 e^{3t}$ is:
- A) $\frac{3}{(s-3)^3}$ B) $\frac{6}{(s-3)^3}$ C) $\frac{6}{(s-3)^4}$ D) $\frac{3}{(s-3)^4}$
20. The inverse Laplace transform of $\frac{1}{(s-2)^2+4}$ is:
- A) $e^{2t} \sin 2t$ B) $\frac{e^{2t} \sin 2t}{2}$
- C) $e^{2t} \cos 2t$ D) $\frac{e^{2t} \cos 2t}{4}$

Read the passage below and choose the most appropriate answer from the options provided for questions 21- 25.

Hit by debris

The James Webb Space Telescope has been hit by a micrometeoroid. NASA says the strike to one of the telescope's primary mirror segments will not affect its performance. The space telescope was engineered to withstand micrometeoroid impacts, although the micrometeoroid strike was larger than scientists had modelled.

21. The word 'debris' is correctly pronounced to rhyme with:
- A) defreeze B) disease C) degree D) decry
22. The 'space telescope' is located:
- A) in outer space B) on Earth
- C) on another planet D) in a laboratory
23. A 'micrometeoroid' is smaller than even: (select the smallest of these)
- A) an asteroid B) a meteor
- C) a comet D) a meteoroid

47. As temperature increases, reverse saturation current of a p-n junction diode
- decreases
 - increases
 - initially decreases, then increases
 - initially increases, then decreases
48. For a bipolar junction transistor, current gain α is 0.99. What will be the emitter current if the base current is $10 \mu\text{A}$?
- 1 mA
 - 9.9 mA
 - $99 \mu\text{A}$
 - 10 mA
49. For the saturation mode of operation of a BJT, which of the following is true?
- Emitter-Base junction is forward biased and Collector-Base junction is reverse biased
 - Emitter-Base junction is reverse biased and Collector-Base junction is forward biased
 - Both Emitter-Base junction and Collector-Base junctions are forward biased
 - Both Emitter-Base junction and Collector-Base junctions are reverse biased
50. What happens to the capacitance value if the total charge given to the capacitor is doubled?
- Doubled
 - Halved
 - Quadrupled
 - Remains same
51. A sine wave $x(t) = 10\sin(300\pi t)$ is applied as input to a centre-tapped full wave rectifier. The output ripple frequency is
- 150 Hz
 - 300 Hz
 - 600 Hz
 - 900 Hz
52. Which of the following regarding Zener shunt regulator is true?
- Changes in load current causes changes in Zener current
 - Changes in load current causes changes in Zener voltage
 - Changes in load current causes changes in both Zener voltage and current
 - Changes in load current will not affect Zener current and voltage
53. The function of emitter resistance in voltage divider biasing circuit is:
- To increase the emitter current
 - Thermal stability of operating point
 - To decrease the emitter-base voltage
 - To increase the emitter-base voltage
54. In a public address system, which of the following unit is used to alter specific frequencies of the sound?
- Fader
 - Delay unit
 - Equalizer
 - Limiter

55. Which of the following statement regarding electronic instrumentation system is true?
- A) A signal conditioner accepts multiple analog inputs and sequentially connects them to one measuring instrument.
 - B) A multiplexer has balancing circuits and calibrating elements.
 - C) A multiplexer accepts analog input and sequentially connects them to multiple measuring instruments.
 - D) A multiplexer accepts multiple analog inputs and sequentially connects them to one measuring instrument.
56. The responsibility of Mobile Switching Centre (MSC) in cellular telephone networks is:
- A) Connects mobile devices to the network
 - B) Routing calls to mobile units as well as to the local telephone system
 - C) Signalling and access to the SIM card
 - D) Control of one or more base transceiver stations
57. The Frequency Modulation (FM) broadcasting band in India is:
- A) 6 MHz – 22 MHz
 - B) 550 kHz – 1650 kHz
 - C) 2.4 GHz – 3.6 GHz
 - D) 88 MHz – 108 MHz
58. The function of mixer in a super heterodyne radio receiver is:
- A) Translates frequency of the incoming signal to a known fixed frequency.
 - B) Combine the amplitude values of incoming signals.
 - C) Selection of desired frequency band from the set of incoming signals.
 - D) Amplification of intermediate frequency.
59. The advantage of using frequency reuse in mobile communication systems is:
- A) Increase the quality of output signal
 - B) Increase the bandwidth of individual users
 - C) Increase the capacity of the system
 - D) Decrease the noise level of the system
60. ----- antenna is an example of wire antenna.
- A) Horn
 - B) Dipole
 - C) Spiral
 - D) Yagi-Uda
61. What is the initial setting time of Ordinary Portland Cement?
- A) 1 hr
 - B) 15 minutes
 - C) 30 minutes
 - D) 10 hrs
62. A bay window is a multi-panel window, which -----.
- A) Is provided at corners
 - B) Runs parallel to the wall
 - C) Embeds inside the wall
 - D) Project outside the wall
63. The member which subdivide the window opening vertically:
- A) Transom
 - B) Top rail
 - C) Mullion
 - D) Ledge

64. The standard size of Brick is?
 A) 190mm x 90mm x 90mm B) 200mm x 100mm x 100mm
 C) 210mm x 90mm x 90mm D) 200mm x 90mm x 90 mm
65. The commonly used lime in white washing is:
 A) White lime B) Fat lime
 C) Hydraulic lime D) Quick lime
66. Dampness causes:
 A) Bleaching of paints B) Crumbling of plaster
 C) Efflorescence D) Growth of termites
67. In abrasion test, what material is placed in addition to the specimen in the testing apparatus?
 A) Metal piece B) Stone piece smaller than specimen
 C) Cast iron ball D) Stainless steel ball
68. The high strength of rapid hardening cement at early stage is due to its:
 A) Burning at high temperature
 B) Increased lime cement
 C) Finer grinding
 D) Higher content of tricalcium
69. What effect does bulking have on fresh concrete?
 A) Strength reduces B) Shrinkage increases
 C) Volume reduces D) Workability increases
70. Type of combined footing consisting of two or more column footing connected by a concrete beam is called ----- footing.
 A) Strip B) Strap C) Mat D) Trapezoidal
71. Which of the following is a property of Fat Lime?
 A) Shakes very slowly B) Contains clay
 C) High degree of plasticity D) Poor binding property
72. Which of the following ions causes the cement to set quickly?
 A) Sulphate B) Carbonate C) Chloride D) Nitrate
73. The base in paint does not serve the function of:
 A) Durability B) Hard and elastic
 C) Protection against UV rays D) Catalyst
74. ----- is **not** an example of sedimentary rock.
 A) Sandstone B) Limestone C) Shale D) Marble
75. Who invented cement?
 A) Joseph Aspidin B) Le - chatelier
 C) Joseph priestly D) Karl von terzaghi

76. Which is true for an adiabatic process?
 A) $\Delta W = 0$ B) $\Delta S = 0$ C) $\Delta Q = 0$ D) $\Delta T = 0$
77. It is desired to increase the efficiency of a Carnot engine operating between a high temperature reservoir at 700 K and a low temperature reservoir at 350 K by 20 percent excess of the current efficiency. If the low temperature reservoir remains constant, then temperature of the high temperature reservoir must be:
 A) 985 K B) 975 K C) 885 K D) 875 K
78. In a Diesel cycle, the working fluid rejects heat during:
 A) Isochoric process B) Isobaric process
 C) Isentropic process D) Isothermal process
79. Which among the following is **not** true for a CRDI engine?
 A) A low pressure feed pump is required
 B) A high pressure pump is required
 C) Common rail generates the pumping pressure
 D) Common rail pressure is higher than the injection pressure
80. When comparing a two stroke petrol engine with a four stroke petrol engine of same size:
 A) Two stroke engine require a heavier flywheel
 B) Two stroke engine require a lighter flywheel
 C) Two stroke engine require no flywheel
 D) Both two and four stroke engine require flywheel of same mass
81. In a vapour compression refrigeration cycle, the working fluid rejects heat at the -----.
 A) Expansion valve B) Evaporator
 C) Compressor D) Condenser
82. The humidification process is used to increase the:
 A) Specific humidity B) Relative humidity
 C) Wet-bulb temperature D) Dry-bulb temperature
83. The Pelton turbine is----- impulse turbine.
 A) Mixed flow B) Radial flow
 C) Axial flow D) Tangential flow
84. The overall efficiency of a water turbine is the ratio of:
 A) Power at the shaft to the power at the inlet of the turbine
 B) Power at the inlet of the turbine to the power at the shaft
 C) Power at the shaft to the power developed by the runner
 D) Power developed by the runner to the power at the shaft

85. In certain occasions, belt drives are preferred to chain drives because:
- Belt drives transmit more power than chain drives
 - Belt drives gives high transmission efficiency
 - Belt drives ensures positive power transmission
 - Cost of operation of belt drives is lower than that of chain drives
86. The feed rod in a lathe is used to move the -----.
- Tailstock centre
 - Carriage
 - Steady rest
 - Step cone pulley
87. The permissible range of water content in green sand is ----- percent.
- 10 to 12
 - 8 to 10
 - 6 to 8
 - 4 to 6
88. In metal arc welding, too small bead formation is due to:
- High welding voltage
 - High welding current
 - Low welding voltage
 - Low welding current
89. A CNC machine essentially consists of:
- Main frame computer
 - Microprocessor
 - Punched cards
 - Control unit
90. Which of the following smith forging operations is used to reduce the length of a work piece?
- Setting down
 - Swaging
 - Upsetting
 - Punching
91. The unit of force in SI system of units is:
- Dyne
 - Kilogram
 - Newton
 - Watt
92. The tendency of rotation of the body along any axis is:
- Impulse
 - Momentum
 - Torque
 - Inertia
93. Materials which have the same elastic property in all direction:
- Isotropic
 - Ideal
 - Uniform
 - Elastic
94. The maximum friction force, at the time of impending motion is called ----friction.
- Dry
 - Static
 - Kinetic
 - Limiting
95. The resultant of two forces P and Q acting at an angle θ is?
- $P^2 + Q^2 + 2PQ \cos\theta$
 - $P^2 + Q^2 + PQ \cos\theta$
 - $P^2 + Q^2 + 2PQ \tan\theta$
 - $\sqrt{(P^2 + Q^2 + 2PQ \cos\theta)}$
96. The unit of moment of inertia of an area is:
- Kg-m^2
 - m^4
 - kg/m^2
 - m^3
97. A projectile is fixed at an angle θ to the vertical, its horizontal line will be maximum when θ is equal to -----.
- 0°
 - 45°
 - 60°
 - 90°

98. ----- is the basic law for mechanics:
 A) Newton's laws of viscosity
 B) Parallelogram law
 C) Newton's laws of motion
 D) Hooke's law
99. SI units of force and energy are respectively:
 A) Newton and watt
 B) Dyne and Erg
 C) Newton and Joule
 D) Kg watt and joule
100. When there is no relative force between touching surfaces, ----- friction force is developed.
 A) Dry
 B) Dynamic
 C) Static
 D) Fluid
101. The change in the moment is equal to which of the following?
 A) Rotational moment
 B) Bending moment
 C) Total weight
 D) Area under the shear diagram
102. ----- doesn't affect frictional force.
 A) Surface roughness
 B) Force tending to cause motion
 C) Reaction of surface
 D) Area of contact
103. The energy possessed by a body due to change in its position is ----- energy.
 A) Potential
 B) Kinetic
 C) Mechanical
 D) Absolute
104. SI unit of kinematic viscosity:
 A) m/s^2
 B) m^2/s
 C) cm/s
 D) cm/s^2
105. The radius of gyration is the property of:
 A) End conditions
 B) Geometry
 C) Loading
 D) Material
106. Which of the following is an exit controlled loop?
 A) while loop
 B) for loop
 C) do-while loop
 D) Nested loop
107. Find the output of the following code?
- ```
#include<stdio.h>
main()
{
int x=4;
constint y=6;
y++;
printf("%d",y);
}
```
- A) 6  
 B) 7  
 C) 5  
 D) Compilation error

108. Consider the following statements and choose the correct option?
1. strcmp is an inbuilt string function
  2. strcmp can return only 0 and 1
  3. strcmp supports both case sensitive and case insensitive checking
- A) 1, 2 and 3                      B) 1 and 3 only  
 C) 1 only                              D) 1 and 2 only
109. Variables that are both alive and active throughout the entire C programme are part of ----- storage class type.
- A) Automatic    B) Register    C) Static    D) External
110. Which of the following statements is **not** true about functions in C?
- A) Functions enable code reuse
  - B) Functions after execution returns multiple values.
  - C) Every programme must contain at least one function
  - D) Functions are capable of hiding information
111. The function in which both called function and calling function is same are called?
- A) User defined functions    B) Recursive function  
 C) Standard library function    D) None of the above
112. Arguments that are given as input by user before running a program are called?
- A) Function arguments
  - B) Formal arguments
  - C) Command-Line arguments
  - D) Parameterized arguments
113. Choose the correct statement about call by value in C?
- A) Call by value does not use pointers.
  - B) Call by Value copies the variable value in multiple memory locations
  - C) Call by value protects original variables from changes in called functions
  - D) All of the above
114. Which of the following statement is **not** true about gets() function in C?
- A) gets() read input from the standard input.
  - B) gets() read the input until it encounters newline.
  - C) gets() do array bound testing.
  - D) gets() has a return type.
115. Find the odd one among the following?
- A) Assembler    B) Web browser    C) Compiler    D) Debugger
116. Choose the correct statement about the given ternary operator condition? expression 1: expression 2
- A) if both expressions are true condition will be checked.
  - B) if condition is false expression 1 will be evaluated else expression 2.
  - C) if condition is true expression 1 will be evaluated else expression 2.
  - D) Both expressions will be evaluated irrespective of condition.

117. What is the return type of pow() function in C?  
 A) float                      B) char                      C) double                      D) integer
118. Find the output of the following code?  

```
#include <stdio.h>
#include <string.h>
void find()
{
char f[50];
char h[] = "Bye";
printf("%s", h);
strcpy(f, h);
printf("%s", f);
}
void main() {
find();
}
```

 A) eyB Bye                      B) Bye  
 C) ByeBye                      D) Compilation Error
119. Which of the following is **not** a reserved keyword in C?  
 A) auto                      B) switch                      C) main                      D) default
120. Find the correct hierarchy of arithmetic operators in C?  
 A) \* / + -                      B) + - \* /                      C) \* + - /                      D) - \* + /

\*\*\*\*\*