ENT - 48

Seat No.

Total No. of Pages : 10

M. Sc. (Physics)
Re-Entrance Examination, 2026
Subject Code: 58718

Day and Date : Wednesday, 24-06-2026 **Total Marks : 100**

Time : 02:30 pm to 04:00 pm

Instructions:

1. All questions are compulsory
2. Each question carries one mark
3. Mark the correct answer in the given OMR by darkening the appropriate circle
4. Use a black pen only for marking the circle. Do not make any stray marks on the answer sheet
5. Follow the instructions given in the OMR sheet.
6. Use the paper sheet provided for rough work
7. The OMR Answer Sheet and Question Paper should be handed over to the supervisor after exam-ination
8. Only a Non-Programmable calculator is allowed

1. With increase in resistance R in the LCR series circuit, the band-width

   A. increases B. decreases C. remains constant D. becomes zero

2. The series LCR circuit is known as ... circuit

   A. acceptor B. rejector C. complex D. DC

3. Thevenin's theorem uses a .....source

   A. current B. voltage C. both A and B D. None of the above

4. Norton's theorem uses a .....source

   A. current B. voltage C. both A and B D. None of the above

5. Resistor is ..... circuit element

   A. active B. passive C. both active as well as passive D. None of the above

6. The scalar product of two mutually perpendicular vectors is equal to

   A. its magnitude B. square of its magnitude C. zero D. None of the above

7. when two vectors $\vec{P}$ and $\vec{Q}$ of unequal magnitude are oppositely directed to each other then magnitude of its resultant is...

   A. $P-Q$ B. $P+Q$ C. P^2-Q^2 D. P^2+Q^2

8. The equation, $\frac{dy}{dx} = sin(x)$ is ....differential equation

   A. linear B. non-linear C. homogeneous D. first order non-linear

9. when external force acting on a particle is zero, its .....is conserved.

   A. linear momentum B. angular momentum C. total energy D. None of the above

10. when external torque acting on a system is zero, its .....is conserved

    A. linear momentum B. angular momentum C. total energy D. None of the above

11. In XY-plane, a particle moves parallel to X-axis, at y = b with constant linear momentum (mv), then its angular momentum is ....

    A. zero B. mvb along -Z axis C. mvb along +X axis D. None of the above

12. The entropy of the universe is tending to ...

    A. zero B. minimum C. maximum D. remain constant

13. Efficiency of Carnot's heat engine is ...

    A. zero B. one C. greater than one D. less than one

14. All natural processes are ...

    A. reversible B. irreversible C. isothermal D. adiabatic

15. During reversible process ...remains constant

    A. entropy B. temperature C. volume D. density

16. Coefficient of viscosity of a gas at absolute temp T is proportional to

    A. $\sqrt{T}$ B. T C. T^2 D. T^{-2}

17. Beat frequency of two SHM's of frequencies n_1 and n_2 is given by

    A. n_1-n_2 B. n_1+n_2 C. $n_1 \times n_2$ D. $n_1 \pm n_2$

18. The required phase difference between two SHM at right angle to each other having oblique elliptical resultant is ... ...

    A. 4π B. 6π C. 2π D. $\pi/4$

19. In a coupled oscillator, the symmetric mode of oscillation has ....frequency than that of antisymmetric mode of oscillation.

A. greater than B. less than C. equal to D. half of

20. The symmetric mode of oscillation has the same frequency to that of...

A. simple pendulum B. compound pendulum C. asymmetric mode D. beat frequency

21. Microphones are ....

A. active transducers B. passive transducers C. transducers D. amplifiers

22. For a perfectly black body, the coefficient of absorption and reflection are ....

A. 0 and 1 B. 1 and 0 C. 1 and 1 D. 0 and 0

23. Wein's displacement law can be stated mathematically as ....

A. $\lambda_m^2 T = \text{constant}$ B. $\lambda_m^{-2} T = \text{constant}$ C. $\lambda_m T = \text{constant}$ D. $\lambda^4 T = \text{constant}$

24. The mathematical relation between entropy and probability can be stated as.....

A. $S = kW$ B. $S = WlnK$ C. $S = KlnW$ D. $S = K/W$

25. The phase space is the superposition of a ... space and ....space

A. Position and Momentum B. Position and Energy

C. Energy and Time D. Position and Angular Momentum

26. The volume of the cell in phase space is

A. $\hbar$ B. $\hbar^2$ C. $\hbar^3$ D. $\hbar^4$

27. If the equation $\frac{d^2y}{dx^2} + H(x)\frac{dy}{dx} + B(x)y = 0$, the function $P(x)$ and $Q(x)$ are analytic at point $x = x_0$, then the point x_0 is ....point

A. ordinary B. singular C. both A and B D. none of these

28. For the equation, $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = 0$, the point of regular singularity is ....

A. $x = \infty$ B. $x = 1$ C. $x = 0$ D. None of these

29. The Bessel's equation $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + (x^2 - n^2)y = 0$ has regular singularity at .....point

A. $x = \infty$ B. $x = 0$ C. $x = 1$ D. $x = n$

30. The modulus of complex number $2(\sqrt{3} + i)$ is

A. 2 B. 4 C. $2\sqrt{3}$ D. None of these

31. The argument of complex number $-1 - \sqrt{3}i$ is...

A. $\pi/3$ B. $2\pi/3$ C. $4\pi/3$ D. $5\pi/6$

32. The value of $log(i)$ is ....

A. 1 B. $\pi/2$ C. $i\pi/2$ D. $i\pi/2$

33. The value of $e^{(i\pi/2)}$

A. 1 B. $1+i$ C. i D. $-i$

34. Phase velocity (u) is given by

A. $u = \frac{\Delta\omega}{\Delta k}$ B. $u = \frac{\Delta k}{\Delta\omega}$ C. $u = \frac{\omega}{k}$ D. $u = \frac{k}{\omega}$

35. Uncertainty principle is expressed as

A. $\Delta E \cdot \Delta p \geqslant \hbar$ B. $\Delta E \cdot \Delta x \geqslant \hbar$ C. $\Delta x \cdot \Delta t \geqslant \hbar$ D. $\Delta x \cdot \Delta p \geqslant \hbar$

36. The orthogonal condition for the wave functions $\psi_1(x)$ and $\psi_2(x)$ is

A. $\int_a^b \psi_1^*(x)\psi_2^*(x)dx = 0$ B. $\int_a^b \psi_1(x)\psi_2(x)dx = 0$

C. $\int_a^b \psi_1^*(x)\psi_2(x)dx = 0$ D. $\int_a^b \psi_2^*(x)\psi_2(x)dx = 0$

37. If the wave function is $\psi(x,t) = Ae^{\lambda|x|}e^{-i\omega t}$ where A, λ, ω are real and positive, then A is equal to .....

A. $A = \sqrt{\lambda}$ B. $A = \lambda$ C. $A = \lambda^2$ D. $A = \lambda^3$

38. $[L_+L_-] =$ .....

A. $\hbar L_+$ B. $2\hbar L_z$ C. $\hbar L_z$ D. $\hbar L_-$

39. Commutation relations among position and momentum operator are expressed as

A. $[x_i p_j] = i\hbar\delta_{ij}$ B. $[x_i p_j] = -i\hbar\delta_{ij}$ C. $[x_i p_j] = i\hbar$ D. $[x_i p_j] = 0$

40. The non-degenerate state of the energy possessed by a particle in three-dimensional rigid box is given by

A. $n_x = 3, n_y = 3, n_z = 3$ B. $n_x = 2, n_y = 2, n_z = 2$

C. $n_x = 4, n_y = 4, n_z = 4$ D. $n_x = 5, n_y = 5, n_z = 5$

41. The zero point energy of linear harmonic oscillator is

A. $E_0 = 0$ B. $E_0 = \hbar\omega$ C. $E_0 = 2\hbar\omega$ D. $E_0 = \frac{1}{2}\hbar\omega$

42. NAND gate is also called as ..... gate.

A. Unique B. Complete C. Universal D. Logic

43. ..... is a logic circuit that adds 2 binary digits at a time.

A. Full adder B. Half adder C. Flip-flop D. Gates

44. In a transistor $I_c = 2mA$, $I_B = 0.5mA$ then $I_E =$

A. 1 mA B. 3 mA C. 0 mA D. 2.5 mA

45. The gain with feedback is called ..... gain

A. Closed loop B. Open loop C. Both D. None

46. Power source used in CRO is about ..... volts

A. 200 B. 180 C. 360 D. 2000

47. The gain control of the vertical amplifier is calibrated in terms of .....

A. voltage B. current C. potential D. deflection sensitivity

48. The closed loop gain on non-inverting operational amplifier is A_{CL} = ...

A. $\frac{R_f}{R_1}$ B. $-\frac{R_f}{R_1}$ C. $1+\frac{R_f}{R_1}$ D. $1-\frac{R_f}{R_1}$

49. In IC 555 reset terminal pin 2 is ..... terminal

A. Ground B. Trigger C. Reset D. Threshold

50. For a system of N particles moving independent of each other, the number of degrees of freedom is .....

A. N B. 2N C. 3N D. 6N

51. Langrange's equation of motion for conservative holonomic system is .....

A. $\frac{d}{dt}\left(\frac{\partial L}{\partial \dot{q_j}}\right) - \frac{\partial L}{\partial q_j} = 0$ B. $\frac{d}{dt}\left(\frac{\partial L}{\partial \dot{q_j}}\right) + \frac{\partial L}{\partial q_j} = 0$

C. $\frac{d}{dt}\left(\frac{\partial L}{\partial q_j}\right) - \frac{\partial L}{\partial q_j} = 0$ D. $\frac{d}{dt}\left(\frac{\partial L}{\partial q_j}\right) + \frac{\partial L}{\partial q_j} = 0$

52. Hamilton's principle is a .....

A. differential principle B. integral principle C. both as stated above D. none of these

53. In a variational principle, the line integral of a function between two end points is .....

A. zero B. infinite C. stationary D. one

54. In Galilean relativity the transformation equation for x coordinate from S to S' is .....

A. $x' = vt - x$ B. $x' = x - \frac{vt}{c^2}$ C. $x' = \frac{x-vt}{\sqrt{1-\frac{v^2}{c^2}}}$ D. $x' = x - vt$

55. The Lorentz transformation equation of time shows that the space and time are not two ..... entities.

A. related B. dependent C. independent D. different

56. The Poisson's equation is represented as .....

A. $\vec{\nabla} \cdot \vec{E} = 0$ B. $\vec{\nabla} \cdot \vec{V} = \frac{\rho}{\varepsilon_0}$ C. $\nabla^2 V = -\frac{\rho}{\varepsilon_0}$ D. $\nabla^2 \cdot E = 0$

57. Lorentz force is given by $\vec{F}$ .....

A. $q\left[\vec{v}\times\left(\vec{B}+\vec{E}\right)\right]$ B. $q\left[\vec{B}+\left(\vec{v}\times\vec{E}\right)\right]$ C. $q\left[\vec{B}+\left(\vec{E}\times\vec{v}\right)\right]$ D. $q\left[\vec{E}+\left(\vec{v}\times\vec{B}\right)\right]$

58. Isobars are the nuclides with same..... but different .....

A. A-values , Z-values B. A-values , N-values C. Z-values , A-values D. N-values , Z-values

59. Most stable nuclide is .....

A. ${}^{16}_{8}O$ B. ${}^{41}_{2}1Ca$ C. ${}^{206}_{82}Pb$ D. ${}^{3}_{1}H$

60. The first orbital resonance accelerator built was .....

A. Cyclotron B. Synchrocyclotron C. Betatron D. Proton synchroton

61. The phase stable orbit condition in synchrocyclotron is that the instantaneous P.D. across dees is.....

A. zero and about to become accelerating B. zero and about to become decelerating

C. positive and very large D. negative and very large

62. The gas amplification in GM-counter is .....

A. less than unity B. equal to unity C. $\sim 10^3$ D. $\sim 10^8$

63. Cerenkov radiations are emitted by particle moving with a velocity ..... the phase velocity of light in same transparent medium.

A. half B. less than C. greater than D. equal to

64. ..... interactions are very weak, but have very large range.

A. strong B. electromagnetic C. weak D. gravitational

65. ....are composite of quark (u and d) and an antiquark ($\bar{u}$ and $\bar{d}$)

A. Leptons B. Nucleons C. Pions D. Hyperons

66. The number of atoms per unit cell of BCC crystal is

A. 1 B. 2 C. 3 D. 4

67. The $\frac{c}{a}$ ratio for hcp crystal is

A. $\frac{2\sqrt{2}}{\sqrt{3}}$ B. $\frac{2\sqrt{3}}{\sqrt{2}}$ C. $\frac{\sqrt{3}}{2\sqrt{2}}$ D. $\frac{\sqrt{2}}{3}$

68. Reciprocal lattice to FCC lattice is

A. SC B. FCC C. BCC D. HCP

69. In Laue's method of X-ray diffraction

A. λ is fixed while both Θ and d varies B. λ is fixed and Θ varies

C. Θ is fixed and λ varies D. Θ and λ both are fixed

70. The susceptibility of diamagnetic material is

A. positive and small B. positive and large C. negative and small D. zero

71. The Curie law of paramagnetism holds good for

A. $\mu B = kT$ B. $\mu B \gg kT$ C. $\mu B \ll kT$ D. $\mu B = \frac{1}{kT}$

72. The density of electron states is proportional to

A. E B. E^{-1} C. $\sqrt{E}$ D. $\frac{1}{\sqrt{E}}$

73. In Hall effect if the current is flowing due to motion of holes, then Hall coefficient is

A. positive B. negative C. either positive or negative D. zero

74. Selection rule for j in emission transitions is

A. $\Delta j = 0$ B. $\Delta j = 1$ C. $\Delta j = -1$ D. $\Delta j = \pm 1$

75. When sodium atom is placed in weak magnetic field, D_1-line corresponding to transition $(^2S_{\frac{1}{2}} - {}^2P_{\frac{1}{2}})$ splits into

A. 2-components B. 4-components C. 6-components D. 8-components

76. Rotational kinetic energy of J-level of a diatomic molecule is proportional to

A. J(J+1) B. moment of inertia C. both (a) and (b) D. bond length

77. Frank-Condon principle helps in estimating the .....

A. moment of inertia of the molecule B. bond length

C. reduced mass of molecule D. intensity of bands

78. Raman shift corresponds to.... spectral region

A. X-ray B. ultraviolet C. visible D. infra-red

79. To observe Raman effect molecule must be

A. polar B. non-polar C. ionic D. any of the above

80. Birth place of all stars is

A. Milky-way galaxy B. solar system C. interstellar medium D. ylem

81. A star in the process of formation is called

A. Protostar B. Red-giant C. White dwarf D. Cephied variable

82. If V_i is the incoming wind velocity for a horizontal axis type wind-turbine then maximum power output P of turbine is

A. $P_{max} \propto V_i^2$ B. $P_{max} \propto V_i^3$ C. $P_{max} \propto V_i$ D. $P_{max} \propto \sqrt{V_i}$

83. The axial induction factor of wind turbine lies between

A. 1 and ∞ B. 0 and 1 C. 0 and ∞ D. 1 and -1

84. Clarity index has unit

A. $\frac{W}{m^2}$ B. $\frac{W}{m}$ C. no unit D. $\frac{J}{m^2}$

85. In solar PV panel there are n solar cell in module, m number of modules in a panel and P_C power of single cell, then power of the PV panel is

A. nmP_C B. $\frac{nm}{P_C}$ C. $\frac{P_C}{nm}$ D. $(n+m)P_C$

86. Biogas is ..... gas

A. methane B. propane C. butane D. ethane

87. The critical temperature of a superconductor at zero magnetic field is T_c. At which temperature, the critical field becomes half of its value at 0° K

A. $T = \frac{T_c}{\sqrt{2}}$ B. $T = \frac{T_c}{\sqrt{3}}$ C. $T = \frac{T_c}{\sqrt{6}}$ D. $T = \frac{T_c}{\sqrt{5}}$

88. The magnetic lines of force cannot penetrate the body of a superconductor, this phenomenon is known as

A. isotope effect B. London's effect C. Meissner effect D. BCS theory

89. Which of the following is an example of top-down approach for the preparation of nanomaterials?

A. Ball milling B. nucleation and growth

C. Molecular beam epitaxy D. Gas phase agglomeration

90. The order and degree of the differential equation $\frac{\partial^2 z}{\partial x^2} = k\frac{\partial z}{\partial y}$ is

A. 1,2 B. 1,1 C. 2,1 D. 2,2

91. To solve the equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial t^2}$ by method of separation of variables, we assume the solution in the form $u(x, y, t) =$

A. $X(x)Y(y)Z(z)$ B. $X(x)Y(y)$ C. $X(x)Y(y)T(t)$ D. None of these

92. For the equation $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = 0$, the point of regular singularity is

A. $x = \infty$ B. $x = 1$ C. $x = 0$ D. None of these

93. Legendre's differential equation has general solution in the form

A. $y = AP_n(x)$ B. $y = BQ_n(x)$ C. $AP_n(x) + BQ_n(x)$ D. None of these

94. If $x = 0$ is regular singularity of the differential equation, then its series solution is assumed in the form

A. $y = \sum_{m=0}^{\infty} a_m x^m$ B. $y = \sum_{m=0}^{\infty} a_m x^{k+m}$

C. $y = \sum_{m=0}^{\infty} a_m x^{k-m}$ D. either (A) or (C)

95. The value of $\Gamma\frac{3}{2}$ is

A. $\frac{\sqrt{\pi}}{2}$ B. $\pi\sqrt{2}$ C. $\frac{\pi}{2}$ D. $\frac{\pi}{\sqrt{2}}$

96. $\beta(m, n+1) + \beta(m+1) =$

A. $\frac{m}{m+n}\beta(m,n)$ B. $\frac{n}{m+n}\beta(m,n)$ C. $\beta(m,n)$ D. 1

97. $erf(x) + erf_c(x) =$

A. 1 B. 2 C. 0 D. none of these

98. The modulus of complex number $2(\sqrt{3}+i)$ is

A. 2 B. 4 C. $2+\sqrt{3}$ D. none of these

99. Cauchy-Riemann conditions for function $f = u + iv$ to be analytic are

A. $\frac{\partial u}{\partial x} = \frac{\partial u}{\partial y}, \frac{\partial v}{\partial x} = \frac{\partial v}{\partial y}$ B. $\frac{\partial u}{\partial x} = \frac{\partial v}{\partial y}, \frac{\partial u}{\partial y} = \frac{\partial v}{\partial x}$

C. $\frac{\partial u}{\partial x} = \frac{\partial v}{\partial y}, \frac{\partial u}{\partial y} = -\frac{\partial v}{\partial x}$ D. $\frac{\partial u}{\partial x} = \frac{\partial v}{\partial x}, \frac{\partial u}{\partial y} = \frac{\partial v}{\partial y}$

100. Which of the following function is not analytic?

A. $f(z) = z$ B. $f(z) = e^z$ C. $f(z) = x^2 + 2ixy$ D. $f(z) = z^2$

❑❑❑

- Rough Work -