065/2018

Question Booklet Alpha Code	A	Question Booklet Serial Number	

Total Number of Questions : 100 **Time : 75 Minutes**

Maximum Marks : 100

1. The question paper will be given in the form of a Question Booklet. There will be four versions of question booklets with question booklet alpha code viz. **A**, **B**, **C** & **D**.
2. The Question Booklet Alpha Code will be printed on the top left margin of the facing sheet of the question booklet.
3. The Question Booklet Alpha Code allotted to you will be noted in your seating position in the Examination Hall.
4. If you get a question booklet where the alpha code does not match to the allotted alpha code in the seating position, please draw the attention of the Invigilator IMMEDIATELY.
5. The Question Booklet Serial Number is printed on the top right margin of the facing sheet. If your question booklet is un-numbered, please get it replaced by new question booklet with same alpha code.
6. The question booklet will be sealed at the middle of the right margin. Candidate should not open the question booklet, until the indication is given to start answering.
7. Immediately after the commencement of the examination, the candidate should check that the question booklet supplied to him contains all the 100 questions in serial order. The question booklet does not have unprinted or torn or missing pages and if so he/she should bring it to the notice of the Invigilator and get it replaced by a complete booklet with same alpha code. This is most important.
8. A blank sheet of paper is attached to the question booklet. This may be used for rough work.
9. **Please read carefully all the instructions on the reverse of the Answer Sheet before marking your answers.**
10. Each question is provided with four choices (A), (B), (C) and (D) having one correct answer. Choose the correct answer and darken the bubble corresponding to the question number using Blue or Black Ball Point Pen in the OMR Answer Sheet.
11. **Each correct answer carries 1 mark and for each wrong answer 1/3 mark will be deducted. No negative mark for unattended questions.**
12. No candidate will be allowed to leave the examination hall till the end of the session and without handing over his/her Answer Sheet to the Invigilator. Candidates should ensure that the Invigilator has verified all the entries in the Register Number Coding Sheet and that the Invigilator has affixed his/her signature in the space provided.
13. Strict compliance of instructions is essential. Any malpractice or attempt to commit any kind of malpractice in the Examination will result in the disqualification of the candidate.

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1. Total energy density due to electric and magnetic fields is given by :

(A) $\frac{1}{2}\left(\varepsilon E^2 + \mu H^2\right)$ (B) $\frac{1}{2}(\varepsilon E + \mu H)$

(C) $\left(\varepsilon E^2 + \mu B^2\right)$ (D) $\frac{1}{2}\left(\mu E^2 + \varepsilon H^2\right)$

2. Poynting vector is given by :

(A) $\mu_0(E x H)$ (B) $\varepsilon_0(E x B)$ (C) $(E x H)$ (D) $(E x \mu B)$

3. Intrinsic impedance of free space is :

(A) $\frac{\mu_0}{\varepsilon_0}$ (B) $\sqrt{\frac{\mu_0}{\varepsilon_0}}$ (C) $\sqrt{\frac{\mu}{\varepsilon}}$ (D) $\sqrt{\frac{\mu_r}{\varepsilon_r}}$

4. The dominant transverse electric wave in a rectangular wave guide is :

(A) TE_{10} (B) TE_{11} (C) TE_{01} (D) TE_{00}

5. If n_1 and n_2 are the refractive indices of the two non-conducting media, the reflection coefficient for normal *l* incidence at the interface is given by :

(A) $\left(\frac{n_2 - n_1}{n_2 + n_1}\right)^2$ (B) $\left(\frac{n_2 + n_1}{n_2 - n_1}\right)^2$

(C) $\frac{4n_1n_2}{n_1 + n_2}$ (D) $\left(\frac{n_2 - n_1}{n_2 + n_1}\right)$

6. In the presence of both electric and magnetic fields, the net force on a charge Q moving with velocity "*v*" is :

(A) $F = EQ(vxB)$ (B) $F = QE.B$

(C) $F = Q(B + vxE)$ (D) $F = Q(E + vxB)$

7. Enthalpy "H" is mathematically defined as :

(A) $H = U + dQ$ (B) $H = U - PV$

(C) $H = U + PV$ (D) $H = U + TS$

8. Collection of a large number of essentially independent systems having the same temperature T, volume V and same number of identical particles n is known as :

(A) Microcanonical ensemble (B) Canonical ensemble

(C) Grand canonical ensemble (D) Macrocanonical ensemble

9. Electrons obey :

(A) Bose - Einstein Statistics (B) Maxwell - Boltzmann Statistics

(C) Fermi - Dirac Statistics (D) All three Statistics

10. In grand canonical ensemble, the comprising systems can :

(A) exchange both energy and particles

(B) exchange only energy

(C) exchange particles only

(D) not exchange particles or energy

11. Particles obey Pauli's exclusion principle in :

(A) Bose - Einstein Statistics (B) Fermi - Dirac Statistics

(C) Maxwell - Boltzmann Statistics (D) all the three Statistics

12. Lande's "g" factor for the $3^2 P_{3/2}$ level of sodium atom is :

(A) 2 (B) $\frac{1}{2}$ (C) $\frac{4}{3}$ (D) $\frac{2}{3}$

13. Two or more electrons are said to be equivalent if they have :

(A) same l and s values (B) same n and m_1 values

(C) same n and j values (D) same n and l values

14. Which of the following will give microwave spectrum ?

(A) CO_2 (B) H_2 (C) CS_2 (D) HCl

15. The pumping scheme used in solid state lasers is :

(A) Electrical (B) Magnetic (C) Optical (D) Mechanical

16. Mutual exclusion principle deals with the complementary nature of :

(A) IR and Raman activities (B) NMR and IR activities

(C) ESR and Raman activities (D) Microwave and IR activities

17. Which of the following is **not** a property of laser light ?

(A) Directionality (B) Monochromaticity

(C) Coherence (D) Divergence

18. The typical wavelengths emitted or absorbed in Mossbauer spectroscopic studies is in the region of :

(A) gamma rays (B) X-rays (C) microwave (D) visible

19. When an electron jumps from the fourth orbit to the second orbit, we get :

(A) Second line of Pfund series (B) Second line of Lyman series

(C) Second line of Balmer series (D) Second line of Paschen series

20. Cooper pairs are formed by :

(A) electron-phonon-electron interaction

(B) electron-proton interaction

(C) proton-phonon-proton interaction

(D) electron-hole interaction

21. The reciprocal lattice to an fcc lattice is :

(A) an fcc lattice (B) a hcp lattice (C) a sc lattice (D) a bcc lattice

22. The region in k space at $k = \pm\frac{\pi}{a}$ is known as :

(A) First Brillouine zone (B) First energy gap

(C) Second Brillouine zone (D) Band

23. If the applied external field is increased beyond the critical field, the material becomes :

(A) a superconductor (B) normal conductor

(C) insulator (D) semiconductor

24. According to free electron model, the average K.E. of electron at temperature T is :

(A) $\frac{1}{2}$ kT (B) $\frac{3}{2}$ kT (C) kT (D) Zero

25. Which of the following is **not** a property of nuclear forces ?

(A) charge independent (B) strong attractive force

(C) long range force (D) saturated force

26. Nuclear radius R and the atomic mass number A are connected by the relation :

(A) $R = R_0 A^{1/3}$ (B) $R = R_0 A^3$

(C) $R = R_0 A^{2/3}$ (D) $R = R_0 A^{-1/3}$

27. Parity is violated in :

(A) α-decay (B) Fusion

(C) Gamma emission (D) β-decay

28. Energy generation in stars is through :

(A) Nuclear fission (B) Stimulated emission

(C) Nuclear fusion (D) Thermoelectric process

29. Quark combinations of proton and neutron respectively are :

(A) *uds* and *uss* (B) *uss* and *uds*

(C) *uud* and *udd* (D) *uud* and *uds*

30. Which of the following is **not** a baryon ?

(A) Neutron (B) Sigma (C) Proton (D) Muon

31. Phase difference between input and output signals of a CE amplifier is :

(A) 180° (B) 90° (C) 45° (D) 0°

32. The ripple factor for a half wave rectifier is :

(A) 0.406 (B) 0.48 (C) 0.812 (D) 1.21

33. Universal building blocks are :

(A) AND and OR gates (B) NAND and OR gates

(C) NAND and NOR gates (D) AND and NOT gates

34. Which of the following statements is **wrong** ?

(A) LED is a forward biased PN junction

(B) Photodiode is reverse biased PN junction

(C) Solar cell is a PN junction

(D) LED is a reverse biased PN junction

35. In an integrator, the feedback element is :

(A) Capacitor (B) Resistor (C) Zener diode (D) Transistor

36. Hamiltonian is given by :

(A) $T - V$ (B) $T + V$ (C) T/V (D) TV

37. Relation between energy (E) and momentum (P) of a particle of mass M is :

(A) $E = \frac{P}{M}$ (B) $E = \frac{2P}{M}$ (C) $E = \frac{P^2}{2M}$ (D) $E = \frac{P^2}{M}$

38. Which of the following statements is **wrong** ?

(A) Fundamental Poisson brackets are invariant under canonical transformation

(B) All Poisson brackets are canonical invariants

(C) Poisson brackets of canonical variables are known as fundamental Poisson brackets

(D) Poisson brackets are not canonically invariant

39. If a generalized co-ordinate has the dimension of momentum, the generalized velocity will have the dimension of :

(A) Velocity (B) Force (C) Torque (D) Acceleration

40. Angular momentum L is given by :

(A) $L = r \times v$ (B) $L = m \times v$ (C) $L = m(r \times v)$ (D) $L = m(r \times a)$

41. Possible number of degrees of freedom for a rigid body is :

(A) 3 (B) 6 (C) 9 (D) infinite

42. Special theory of relativity deals with events in the frame of reference which moves with constant :

(A) speed (B) velocity (C) acceleration (D) momentum

43. The energy E, rest mass m_0 and the momentum P of a relativistic particle are related as :

(A) $E^2 = m_0^2C^2 + P^2C^2$ (B) $E^2 = m_0^2C^4 + P^2C^2$

(C) $E^2 = m_0^2C^2 + PC$ (D) $E^2 = m_0^2C + P^2C$

44. The K.E. of a body is twice its rest mass energy. Find the ratio of relativistic mass to rest mass of the body :

(A) 3 (B) $\frac{1}{3}$ (C) 2 (D) $\frac{1}{2}$

45. The constraint that can be expressed in the form of an equation connecting co-ordinates and time is known as :

(A) Holonomic (B) Non-holonomic

(C) Sceleronomous (D) Rhombus

46. De-Broglie wavelength of a particle of kinetic energy E is given by :

(A) $\frac{h}{\sqrt{2mE}}$ (B) $\frac{h}{\sqrt{mE}}$ (C) $\frac{h}{mE}$ (D) $\frac{hE}{\sqrt{2m}}$

47. The zero point energy of a linear harmonic oscillator is :

(A) Zero (B) $h\upsilon$ (C) $\frac{1}{2}h\upsilon$ (D) $2h\upsilon$

48. Ground state energy level of a particle in a cubical box is :

(A) six fold degenerate (B) three fold degenerate

(C) two fold degenerate (D) non-degenerate

49. Momentum operator is :

(A) $i\hbar\frac{\partial}{\partial t}$ (B) $\frac{i\hbar}{m}\frac{\partial}{\partial x}$ (C) $-i\hbar\frac{\partial}{\partial x}$ (D) $i\hbar\frac{\partial}{\partial x}$

50. The degree of degeneracy for a three dimensional harmonic oscillator is :

(A) $\frac{1}{2}(n+1)(n+2)$ (B) $\frac{1}{2}(2n+1)(2n+2)$

(C) $(n+1)(n+2)$ (D) $2(n+1)(n+2)$

51. With increase in quantum numbers, the energy difference between successive energy levels of an anharmonic oscillator ?

(A) remains same (B) increases

(C) decreases (D) periodically increase and decrease

52. The uncertainty relation applies to :

(A) Position and momentum only

(B) Energy and time only

(C) Angular momentum and angle only

(D) All canonically conjugate physical quantities whose product has dimensions of action

53. Klein - Gordan equation is valid for :

(A) Electrons (B) Protons

(C) Spin ½ particles (D) Spin zero particles

54. No two electrons can have all the four quantum numbers identical. This is the statement of :

(A) Uncertainty principle (B) Pauli's exclusion principle

(C) Hamilton's principle (D) Gauss principle

55. When curl of a vector is zero in some region, then in that region the vector is :

(A) Rotational (B) Irrotational (C) Diverging (D) Converging

56. Characteristic equation of matrix A is :

(A) $|A-\lambda I|=0$ (B) $|I-\lambda A|=0$ (C) $|A\lambda-I|=0$ (D) $|\lambda-AI|=0$

57. The rank of the matrix $\begin{bmatrix} 3 & 1 & 4 \\ 2 & 4 & 5 \end{bmatrix}$ is :

(A) 6 (B) 1 (C) 2 (D) 3

58. The residue of cot Z at $Z=0$ is :

(A) Zero (B) π (C) -1 (D) 1

59. A point at which a function $f(z)$ ceases to be analytic is called :

(A) singularity (B) double pole (C) pole (D) holonomic

60. Commutative group is called :

(A) semi group (B) abelian group (C) monoid (D) android

61. A group having no proper normal subgroup is called :

(A) normal subgroup (B) abelian subgroup

(C) simple group (D) trivial subgroup

62. Kronecker delta is a mixed tensor of order :

(A) One (B) Two (C) Zero (D) Three

63. If $\int_{-1}^{+1} P_n(x)dx = 2$ then, $n = ?$

(A) 1 (B) Zero (C) 2 (D) -1

64. The total solar radiation received at any point on the earth is referred to as :

(A) albedo (B) beam radiation

(C) diffuse radiation (D) insolation

65. Structures formed with semiconductor thin films of different band gaps stacked one after the other is known as :

(A) multiple quantum wells (B) quantum well

(C) quantum wire (D) quantum dot

66. In quantum dots, charge carriers are confined in :

(A) two dimensions (B) one dimension

(C) three dimensions (D) in a plane

67. Higgs boson has a spin :

(A) Zero (B) One (C) $\frac{1}{2}$ (D) $\frac{-1}{2}$

68. Self reinforcing solitary wave packet that maintains its shape while it propagates at a constant velocity is named as :

(A) Bions (B) Solitons (C) Gluons (D) Photons

69. Negative index metamaterials have :

(A) negative relative permittivity and positive relative permeability

(B) negative relative permeability and positive relative permittivity

(C) both relative permeability and relative permittivity are negative

(D) positive refractive index

70. Expanding universe theory is based on the observation of :

(A) Astronomical blue shift (B) Astronomical red shift

(C) Astronomical green shift (D) No shift

71. Which among the following may **not** be a criteria for selecting a learning experience ?

(A) Objective-basedness (B) Learner orientation

(C) Practicability (D) Easiness of conducting

72. Which of the following need **not** be included in the methodology chapter of a thesis ?

(A) Procedure adopted for the study

(B) Sample taken for the study

(C) Tools and techniques used for the study

(D) Related literature of the study

73. Arrange the following in **correct** sequence :

(a) Preparation

(b) Recapitulation

(c) Presentation

(d) Generalisation

(e) Comparison

(A) (a), (e), (c), (b), (d) (B) (a), (e), (b), (c), (d)

(C) (a), (c), (e), (d), (b) (D) (a), (c), (b), (e), (d)

74. The authenticity of data in Historical Research can be established through :

(A) External criticism (B) Expert criticism

(C) Internal criticism (D) Systematic criticism

75. Which of the following is LEAST important while selecting a teaching method ?

(A) It should facilitate the creativity of the student

(B) It should provide variety of learning experiences

(C) It should be widely accepted among different disciplines

(D) It should be based on multi-sensory approach

76. Identify the data collection technique that is used in Quantitative Research.

(A) Observation schedule (B) Document review

(C) Interview schedule (D) Aptitude tests

77. Which of the following provides highest concreteness of learning experience ?

(A) Excursion (B) Field trip

(C) Exhibition (D) Dramatisation

78. Which among the following is an intervening variable ?

(A) Teaching method (B) Intelligence

(C) Fatigue (D) Socio-economic level

79. Which of the following belongs to psychomotor domain of objectives ?

(A) Development of information processing skills

(B) Development of desirable attitudes

(C) Development of manipulative skills

(D) Development of critical thinking

80. Which of the following does **not** emphasise time restriction ?

(A) Prognostic test (B) Performance test

(C) Summative test (D) Diagnostic test

81. Which Article of the Indian Constitution described by Ambedkar as the "Heart and Soul" ?

(A) Article 14 (B) Article 52 (C) Article 24 (D) Article 32

82. The term "PURA" is associated with which of the following ?

(A) Project for Urban and Regional Affairs

(B) Provision of Urban Amenities in Rural Areas

(C) Public Undertaking Regulation Act

(D) Public Utilities Regulatory Analyst

83. Identify the Commission appointed to study the problems connected with Centre-State relations.

(A) Sarkaria Commission (B) Mandal Commission

(C) Liberhan Commission (D) Nanavathy Commission

84. In which year Indian Parliament passed the 'Protection of women from domestic violence Act" ?

(A) 2009 (B) 2010 (C) 2007 (D) 2005

85. The concept of Directive Principles of State Policy adopted into the constitution of India from which country ?

(A) Britain (B) USA (C) Ireland (D) Germany

86. From the listed items, identify the schemes related with employment generation and poverty alleviation.

(A) RSBY (B) MGNREGS (C) IRDA (D) ITDP

87. Which part of the Indian constitution deals with fundamental rights ?

(A) Part III (B) Part IV (C) Part VI (D) Part I

88. The term of office of the Chairperson and members of National Commission for Protection of Child Rights ?

(A) 6 years (B) 5 years (C) 4 years (D) 3 years

89. Which article of the Indian constitution deals with constitution amendments ?

(A) Article 352 (B) Article 326 (C) Article 368 (D) Article 360

90. Which organization is related to the Right to Information Act, 2005 ?

(A) Chipko Movement

(B) Bharatiya Kisan Union

(C) Mazdoor Kisan Shakti Sangathan

(D) Narmada Bachao Andolan

91. The social reformer in Kerala started the journal 'Atmavidyakahalam'.

(A) Ayyankali (B) Vaikunda Swamikal

(C) Vaghbhatananda (D) V.T. Bhattathirippad

92. Which event is hailed by Gandhiji as 'A miracle of modern times' ?

(A) Savarna Jatha (B) Temple entry Proclamation

(C) Guruvayur Sathyagraha (D) Vaikom Sathyagraha

93. 'A lighted lantern between two elephants and an open book on a book holder' is the emblem of :

(A) Kerala State Library Council (B) Purogamana Sahithya Prasthanam

(C) Kerala University (D) Nataka Prasthanam

94. Who wrote the book 'Punarjanma Smaranakal' ?

(A) P.K. Chathan Master (B) M.C. Joseph

(C) Swami Ananda Theerthan (D) P. Krishnapillai

95. C.M.S. Press, the first printing press in Kerala was established by :

(A) Elias Kuriakose Chavara (B) Poikayil Yohannan hannan

(C) Benjamine Bailey (D) Hermen Gundert

96. Which Indian city is associated with India's first air conditioned Suburban local train ?

(A) Kolkata (B) Mumbai (C) Bangalore (D) Delhi

97. Who is the Current President of South Korea ?

(A) Moon Jae-in (B) Xi Jinping

(C) Roh Tae-Woo (D) Kim Jong un

98. Which is the hardest substance available on earth ?

(A) Platinum (B) Silver (C) Gold (D) Diamond

99. Bleeding gums or tooth loss is a symptom of the disease :

(A) Glaucoma (B) Scurvy (C) Goitre (D) Beri-beri

100. The World's first country to grant Citizenship to a robot :

(A) Israel (B) Saudi Arabia (C) Britain (D) Germany

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