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प्रश्नपुस्तिका क्रमांक
Question Booklet No.

O.M.R. Serial No. | | | | | | | | |

प्रश्नपुस्तिका सीरीज
Question Booklet Series
**C**

# M.Sc (Electronics) First Semester, Examination, February/March-2022
# ELC-101(N)
# Physics of Electronics Materials

**Time : 1:30 Hours** **Maximum Marks-100**

जब तक कहा न जाय, इस प्रश्नपुस्तिका को न खोलें

**निर्देश :** –

1. परीक्षार्थी अपने अनुक्रमांक, विषय एवं प्रश्नपुस्तिका की सीरीज का विवरण यथास्थान सही– सही भरें, अन्यथा मूल्यांकन में किसी भी प्रकार की विसंगति की दशा में उसकी जिम्मेदारी स्वयं परीक्षार्थी की होगी।
2. **इस प्रश्नपुस्तिका में 100 प्रश्न हैं, जिनमे से केवल 75 प्रश्नों के उत्तर परीक्षार्थियों द्वारा दिये जाने है। प्रत्येक प्रश्न के चार वैकल्पिक उत्तर प्रश्न के नीचे दिये गये हैं। इन चारों में से केवल एक ही उत्तर सही है। जिस उत्तर को आप सही या सबसे उचित समझते हैं, अपने उत्तर पत्रक (O.M.R. ANSWER SHEET)में उसके अक्षर वाले वृत्त को काले या नीले बाल प्वांइट पेन से पूरा भर दें। यदि किसी परीक्षार्थी द्वारा निर्धारित प्रश्नों से अधिक प्रश्नों के उत्तर दिये जाते हैं तो उसके द्वारा हल किये गये प्रथमतः यथा निर्दिष्ट प्रश्नोत्तरों का ही मूल्यांकन किया जायेगा।**
3. प्रत्येक प्रश्न के अंक समान हैं। आप के जितने उत्तर सही होंगे, उन्हीं के अनुसार अंक प्रदान किये जायेंगे।
4. सभी उत्तर केवल ओ०एम०आर० उत्तर पत्रक **(O.M.R. ANSWER SHEET)** पर ही दिये जाने हैं। उत्तर पत्रक में निर्धारित स्थान के अलावा अन्यत्र कहीं पर दिया गया उत्तर मान्य नहीं होगा।
5. ओ०एम०आर० उत्तर पत्रक **(O.M.R. ANSWER SHEET)** पर कुछ भी लिखने से पूर्व उसमें दिये गये सभी अनुदेशों को सावधानीपूर्वक पढ़ लिया जाय।
6. परीक्षा समाप्ति के उपरान्त परीक्षार्थी कक्ष निरीक्षक को अपनी प्रश्नपुस्तिका बुकलेट एवं ओ०एम०आर० शीट पृथक–पृथक उपलब्ध कराने के बाद ही परीक्षा कक्ष से प्रस्थान करें।
7. निगेटिव मार्किंग नहीं है।

**महत्वपूर्ण :** – **प्रश्नपुस्तिका खोलने पर प्रथमतः जॉच कर देख लें कि प्रश्नपुस्तिका के सभी पृष्ठ भलीभॉति छपे हुए हैं। यदि प्रश्नपुस्तिका में कोई कमी हो, तो कक्ष निरीक्षक को दिखाकर उसी सीरीज की दूसरी प्रश्नपुस्तिका प्राप्त कर लें।**

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**Rough Work / रफ कार्य**

1. For a semiconductor-based light source, it should be a.

(A) Direct bandgap semiconductor

(B) Indirect direct bandgap semiconductor

(C) Either direct bandgap or indirect bandgap

(D) The semiconductor can not be used as a light source

2. The B/H curve can be used to determine?

(A) Iron loss

(B) Eddy current loss

(C) Hysteresis loss

(D) Voltage loss

3. The electrical conductivity of metals is typically of the order of (in $ohm^{-1}m^{-1}$)

(A) $10^{7}$

(B) $10^{5}$

(C) $10^{-4}$

(D) $10^{-6}$

4. If the permeability is high, the hysteresis loss is

(A) Infinity

(B) Zero

(C) Infinity

(D) Low

5. In a magnetic material hysteresis loss takes place primarily due to _____?

(A) Rapid reversals of its magnetisation

(B) Flux density lagging behind magnetising force

(C) Molecular friction

(D) Its high retentivity

6. The area of his hysteresis loss is a measure of

(A) Permittivity

(B) Permeance

(C) Energy loss per cycle

(D) Magnetic flux

7. Fermi-Dirac (FD) statistics governs.

(A) Fermions

(B) Free electrons

(C) Fermions & free electrons

(D) None

8. Which of the following is a radiative semiconductor.

(A) Silica

(B) Gallium Arsenide

(C) Germanium

(D) None of the above

9. Hall voltage is developed due to the

(A) Change in the magnetic field

(B) Change in the electric field

(C) Polarization of charges

(D) None of the above

10. In the process of Czochralski method which of the following relation is appropriate between the melt and the growing crystals?

(A) Melt and the growing crystals are usually not related to each other

(B) Melt and the growing crystals are usually rotated counterclockwise

(C) Melt and the growing crystals are usually rotated clockwise

(D) Melt and the growing crystals are usually kept at a constant position

11. A soft magnetic material is having

(A) Low hysteresis loss

(B) Copper loss

(C) High hysteresis loss

(D) None of these

12. Which of the following method has been used to prepare the single crystals of CaO using plasma torch?

(A) Stock Barger method

(B) Zone melting method

(C) Verneuil flame fusion method

(D) Bridgman method

13. For a core having a relative permeability $\mu_r$, magnetic dipole moment per unit volume M and field strength H, the flux density B is.

(A) $B = \mu_r(H+M)$

(B) $B = \mu_0(H+M)$

(C) $B = \mu_0\mu_r(H+M)$

(D) $B = \mu_0\mu_r (H-M)$

14. In an homogeneous dielectric subjected to an electric field E, the dipole moment per unit volume is $\in_0(\in_r-1)$ E.

(A) True

(B) False

(C) Ambiguous statement

(D) None of these

15. The amount of time between the creation and recombination of a free electron and hole is called.

(A) Relaxation time

(B) Life time

(C) Lorentz time

(D) Collision time

16. Hall effect is observed in a specimen (metal or semi conductor) when it is carrying current and is placed in a magnetic field. The resultant electric field inside the specimen is

(A) Normal to both current and magnetic field

(B) In the same direction as current

(C) In a direction anti parallel to magnetic field

(D) None of the above

17. Permeability is analogous to

(A) Resistivity

(B) Retentivity

(C) Conductivity

(D) Coercivity

18. For dielectrics in alternating field, polarizability $_e$ is a complex quantity. The imaginary part of $_e$ is zero for.

(A) $\omega = 0$

(B) $\omega \rightarrow \infty$

(C) $\omega = 0$ and $\omega \rightarrow \infty$

(D) $\omega$ = natural frequency $\omega_0$

19. In the magnetostriction method, a ferromagnet substance changes its shape and size when placed in a

(A) Magnetic field

(B) Alternating current

(C) Electric field

(D) (A) and (B)

20. For constructive interference.

(A) The phase difference should be constant

(B) The phase difference should be zero

(C) The two waves should be out of phase

(D) None of the above

21. Give the thickness range of the film used in thin film technology.

(A) 0.5-2.5 mils

(B) 0.02-8 mils

(C) 10-20 mils

(D) 0.05-0.07 mils

22. Diamagnetic substance are those having a permeability

(A) less than free space

(B) More than free space

(C) Equal to free space

(D) Much greater than free space

23. Which of the following process is involve in thick film technology

(A) Silk screening

(B) Ceramic firing

(C) Screen printing

(D) All of the mentioned

24. Soft magnetic materials have low

(A) Resistivity

(B) Permeability

(C) Conductivity

(D) Coercive force

25. Which technology is used to get cheap resistors and capacitors?

(A) Thin and thick film technology

(B) Thick film technology

(C) Thin film technology

(D) None of the mentioned

26. Which of the following monomers form biodegradable polymers?

(A) 3-hydroxybutanoic acid+3-hydroxypentanoic acid

(B) Glycine + amino caproic acid

(C) Ethylene glycol + phthalic acid

(D) (A) and (B)

27. In paramagnetic materials

(A) Permanent magnetic dipoles exist but the interaction between neighbouring dipoles is negligible

(B) Permanent magnetic dipole do not exist

(C) Permanent magnetic dipole moment may or may not exist

(D) Permanent magnetic dipoles exist and the interaction between neighbouring dipoles is very strong

28. Magnetism of a material can be destroyed by

(A) Heating

(B) Hammering

(C) By inductive action of another magnet

(D) By all above methods

29. Ferrites are a sub-group of

(A) Non-magnetic materials

(B) Ferro-magnetic materials

(C) Paramagnetic materials

(D) Ferri-magnetic materials

30. Oscillations are damped due to the presence of

(A) Linear motion

(B) Restoring force

(C) Frictional force

(D) Mechanical force

31. When an electric field E is applied to solid and liquid insulating materials, the internal field $E_i$ acting at the location of atom is such that.

(A) $E_i = E$

(B) $E_i > E$

(C) $E_i < E$

(D) $E_i$ may be equal to or less than E

32. The relative permeability of ..... materials is not constant.

(A) Diamagnetic

(B) Paramagnetic

(C) Ferromagnetic

(D) Insulating

33. Non-reactive sputtering is usually conducted at a pressure of:

(A) 0.001-0.1Pa

(B) 0.01-1.0 Pa

(C) 0.1-10.0 Pa

(D) 1.0-100 Pa

34. The minority carrier life time and diffusion constant in a semiconduction material are 100 μs and 100 $cm^2/s$ respectively. The diffusion length of carries is.

(A) 0.1cm

(B) 0.01cm

(C) 0.141cm

(D) 1cm

35. Two materials having temperature coefficients of 0.004 and 0.0004 respectively are joined in series. The overall temperature coefficient is likely to be.

(A) 0.08

(B) 0.04

(C) 0.001

(D) 0.0001

36. The hysteresis loss is.

(A) Proportional to frequency

(B) Independent of frequency

(C) Proportional to $(\text{frequency})^2$

(D) Proportional to $\frac{1}{frequency}$

37. Which of the following is true for the resultant polymer product formed, when molecules of pthalic acid react with molecules of glycerol?

(A) Branch polymer

(B) Linear polymer

(C) Cross-link polymer

(D) None of the mentioned

38. Which type of material expands and contract in response to an applied electric field?

(A) Advanced material

(B) Smart material

(C) Biomaterial

(D) Nanomaterial

39. With an increase in temperature, magnetic susceptibility of a ferromagnetic material_____.

(A) Increases

(B) First increases and then decreases

(C) Remains constant

(D) Decreases

40. In sputtering, the target serves as the :

(A) Cathode

(B) Anode

(C) Neutral electrode

(D) None of the above

41. In ferroelectric material, the spontaneous polarization vanishes above____

(A) A. Transition temperature

(B) Debye temperature

(C) Fermi temperature

(D) Curie temperature

42. Chemical vapour deposition is a method which is used to obtain which of the following substance?

(A) Semiconductors

(B) Crystalline semiconductor

(C) Conducting compounds

(D) Non conducting polymers

43. What will be the phase composition of a phase system

(A) The composition of each phase is different throughout the phase diagram

(B) The composition of each phase is same throughout the phase diagram

(C) Varies from molecule to molecule

(D) Contains more than one composition in the entire phase diagram

44. The conduction band of a semiconductor material may be

(A) Completely filled

(B) Partially filled

(C) Empty

(D) None

45. What are the external parameters that affect the phase structure?

(A) Pressure, Composition

(B) Temperature, Pressure

(C) Temperature, Pressure, Composition

(D) Temperature, Composition

46. Superconducting materials are being used in the Superconducting Super Collider to

(A) Cool the particles

(B) Minimize electrical power consumption

(C) Maximize the acceleration potentials

(D) Provide radiation shielding

47. What is the factor that differentiates between Electroless deposition and cathodic deposition?

(A) Anode

(B) Nature of electrolyte

(C) External field

(D) Cathode

48. In electrostriction, when an electric field is applied, polarization may change the ___ of the material.

(A) Resistance

(B) Temperature coefficient

(C) Dimensions

(D) Resistivity

49. Packing efficiency of a crystal structure is the ratio of:

(A) Volume occupied by particles to the total volume of the unit cell

(B) Volume occupied by voids to that by particles

(C) Total volume of the unit cell to the volume occupied by particles

(D) Volume occupied by particles to that by voids

50. Which of the following unit cells do not exist for tetragonal lattices?

(A) Primitive centered unit cell

(B) Face centered unit cell

(C) Body centered unit cell

(D) All of the mentioned exist

51. The density of silver is 10.5 g/cm$^3$ and its atomic weight is 108. If each atom contributes one electron for conduction, what is the fermi energy?

(A) 2.12 eV

(B) 3.31 eV

(C) 5.51 eV

(D) 4.69 eV

52. An electrical current in a superconducting ring will theoretically flow unchanged for:

(A) Several milliseconds

(B) Forever

(C) Several weeks

(D) A second

53. The hard super conductors are those in which the ideal behaviour is seen up to a __critical magnetic field..

(A) Higher

(B) Moderate

(C) Lower

(D) Zero

54. In piezoelectric material,____ energy is converted into electrical energy

(A) Solar

(B) Mechanical

(C) Heat

(D) Chemical

55. In Hall effect, the output voltage produced across the crystal is due to

(A) Drop across the crystal is due to the current passed through it

(B) Induced voltage by the applied magnetic field

(C) Movement of charge carriers towards one end

(D) All of the above

56. The magnitude and direction of lattice distortion are expressed in terms of which vector?

(A) Burger vector

(B) Edge vector

(C) Dislocation vector

(D) Screw vector

57. London dispersion forces exist in ----molecules.

(A) Ionic

(B) Covalent

(C) Monoatomic

(D) Non-Polar

58. Fermi-Dirac statistics is for the ____

(A) Particles with integral spin

(B) Particles with half integral spin

(C) Symmetrical Particles

(D) Distinguishable particles

59. The momentary attraction between the molecules of a liquid caused by instantaneous dipole and induced-dipole attractions are called_____forces.

(A) French

(B) Polar

(C) Van der Waals

(D) London

60. In ferroelectric material, hysteresis loop is a function of applied electric field.

(A) Non-linear

(B) Linear

(C) Parabolic

(D) Exponential

61. What is mobility?

(A) Ease of carrier drift

(B) Ease of movement

(C) Ease of current flow

(D) Ease of access to the junction

62. In the Hall Effect, the directions of electric field and magnetic field are parallel to each other .. The statement is

(A) True

(B) False

(C) Ambiguous Statement

(D) None of these

63. The shifting of electrons in super conductors is prevented by _____

(A) Quantum effect

(B) Energy barrier

(C) Orbitals

(D) Threshold energy level

64. Which of the following formulae doesn't account for correct expression for J?

(A) $\mu H$

(B) I/wd

(C) $\sigma E$

(D) $\rho v$

65. Which of the following statement is correct about smectic liquid crystals?

(A) The flow readily thansmectic liquid crystals

(B) They have liquid like character

(C) Their viscosity is lower than that of liquids

(D) All of these

66. Calculate the hall voltage when the Electric Field is 5V/m and height of the semiconductor is 2cm...

(A) 0.1V

(B) 10V

(C) 1V

(D) 0.01V

67. Drift current is due to

(A) Applied electric field over a given distance

(B) Random motion of holes

(C) Recombination of holes and electrons

(D) Random motion of electrons

68. Nematic is a type of liquid crystal which is based upon

(A) Surface area

(B) Molecules

(C) Ordering

(D) Surface tension

69. Which of the following term is not valid for dielectric materials

(A) Dielectric constant

(B) Permittivity

(C) Polarization

(D) Permeability

70. Cholesteryl benzoate is an example of -----crystal

(A) Smectic

(B) Nematic

(C) Solid

(D) Cholesteric

71. In superconductors, the Fermi energy level is

(A) Midway between the ground state and first excited state

(B) Above first excited state

(C) At first excited state

(D) Below the ground state

72. Which of the following parameters can't be found with Hall Effect?

(A) Conductivity

(B) Polarity

(C) Area of the device

(D) Carrier concentration

73. Which of the following is a crystalline solid?

(A) Copper wire

(B) Rubber ball

(C) Glass bottle

(D) Polythene beg

74. In liquid crystals, temperature affect the

(A) Magnetic field

(B) Electric field

(C) Neutron field

(D) Electromagnetic field

75. Fermi-Dirac statistics cannot be applied to _____

(A) Fermions

(B) Electrons

(C) Protons

(D) Photons

76. Which of the following statements is not valid for relative permittivity

(A) It is dimensionless

(B) Its value for all substances is more than one

(C) It is not equal to unity for vacuum

(D) None of these

77. The equation $J_n=qn\mu_nE$ ($A/cm^2$) represents

(A) Diffusion current density

(B) Drift current

(C) Diffusion current

(D) Drift current density

78. The Hall coefficient of a specimen is $3.66\times10^{-4}$ $m^3C^{-1}$. If it's resistivity is $8.93\times10^{-3}$ $\Omega$m, what will be its mobility?

(A) 0.01 $m^2V$

(B) 0.02 $m^2V$

(C) 0.03 $m^2V$

(D) 0.04 $m^2V$

79. The minimum amount of current passed through the body of superconductor in order to destroy the superconductivity is called

(A) Induced current

(B) Critical current

(C) Eddy current

(D) Hall current

80. Which of the following is used to make Light Emitting Diodes (LED)?

(A) Direct Bandgap Semiconductors

(B) Small Bandgap

(C) Large Bandgap

(D) Indirect Bandgap Semiconductors

81. Which of the following properties is generally exhibited by amorphous solids?

(A) Glass-transition

(B) Equal strength of all bonds

(C) Anisotropy

(D) All of the mentioned

82. The random motion of holes and free electrons due to thermal agitation is called

(A) Ionization

(B) Pressure

(C) Diffusion

(D) None of the above

83. Interaction between neighboring dipoles, is equal and opposite in—material.

(A) Ferromagnetic

(B) Ferriomagnetic

(C) Antiferromagnetic

(D) Paramagnetic

84. Thermal conductivity is defined as the heat flow per unit time

(A) When the temperature gradient is unity

(B) Across the wall with no temperature

(C) Through a unit thickness of the wall

(D) Across unit area where the temperature gradient is unity

85. With an increase in bond length, bond energy:

(A) increases

(B) Decreases

(C) May either increase or decrease

(D) Does not change

86. An n-type semiconductor is

(A) Positively charged

(B) Electrically neutral

(C) Negatively charged

(D) None of the above

87. Which of the following Bravais lattices exist as face centered unit cell?

(A) Orthorhombic

(B) Tetragonal

(C) Monoclinic

(D) None of the mentioned

88. Ferrites show

(A) Diamagnetism

(B) Ferromagnetism

(C) Both (A) &(B)

(D) None of (A) & (B)

89. A semiconductor has _____ temperature coefficient of resistance.

(A) Negative

(B) Positive

(C) Zero

(D) None of above

90. When the atomic magnetic moments are randomly oriented in a solid its magnetic behavior is termed as

(A) Anti-ferromagnetic

(B) Paramagnetic

(C) Ferromagnetic

(D) D. Diamagnetic

91. What is phase?

(A) The substance which is both physically distinct and chemically homogenous

(B) The substance which is homogenous chemically

(C) Substance which is both physically distinct and chemically heterogeneous

(D) The substance which is physically distinct

92. In orientational polarization, rotation of the permanent dipole moments is ____ direction of the applied field.

(A) In opposite

(B) In the

(C) In parallel with the

(D) None

93. The strength of a semiconductor crystal comes from

(A) Forces between nuclei

(B) Forces between protons

(C) Electron-pair bonds

(D) None of the above

94. The dielectric loss is affected by

(A) Presence of humidity

(B) Voltage and temperature increase

(C) Frequency of applied voltage

(D) All of the above

95. Which type of defect are point defects?

(A) One dimensional defect

(B) Two dimensional defect

(C) Three dimensional defect

(D) Zero dimensional defect

96. Which of the following behaves as an insulator.

(A) Silver

(B) Diamond

(C) Silicon

(D) Germanium

97. Which of the following is a secondary bond?

(A) Metallic bond

(B) Covalent bond

(C) Hydrogen bond

(D) Ionic bond

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

(A) Meissner effect

(B) BCS theory

(C) Isotopic effect

(D) London theory

99. Which of the following are the properties of superconductors?

(A) They are diamagnetic in nature

(B) They have zero resistivity

(C) They have infinite conductivity

(D) All of the above

100. All piezo-electric materials are

(A) Dielectric materials

(B) Ferroelectric materials

(C) Ferrielectric materials

(D) None

******

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1. Examinee should enter his / her roll number, subject and Question Booklet Series correctly in the O.M.R. sheet, the examinee will be responsible for the error he / she has made.
2. **This Question Booklet contains 100 questions, out of which only 75 Question are to be Answered by the examinee. Every question has 4 options and only one of them is correct. The answer which seems correct to you, darken that option number in your Answer Booklet (O.M.R ANSWER SHEET) completely with black or blue ball point pen. If any examinee will mark more than one answer of a particular question, then the first most option will be considered valid.**
3. Every question has same marks. Every question you attempt correctly, marks will be given according to that.
4. Every answer should be marked only on Answer Booklet **(O.M.R ANSWER SHEET).**Answer marked anywhere else other than the determined place will not be considered valid.
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