ENTRANCE EXAMINATION-2018
M.Sc. Electronics

SET-C

ROLL NO.

Signature of Invigilator

Time: 2 Hours   Total Marks: 85

Instructions to Candidates

1. Do not write your name or put any other mark of identification anywhere in the OMR Response Sheet. **IF ANY MARK OF IDENTIFICATIONS IS DISCOVERED ANYWHERE IN OMR RESPONSE SHEET**, the OMR sheet will be cancelled, and will not be evaluated.

2. This Question Booklet contains the cover page and a total of **85 Multiple Choice Questions of 1mark each**.

3. Space for rough work has been provided at the beginning and end. Available space on each page may also be used for rough work.

4. There is negative marking in Multiple Choice Questions. For each wrong answer, 0.25 marks will be deducted.

5. USE OF CALCULATOR IS NOT PERMITTED.

6. USE/POSSESSION OF ELECTRONIC GADGETS LIKE MOBILE PHONE, iPhone, iPad, pager ETC. is strictly **PROHIBITED**.

7. Candidate should check the serial order of questions at the beginning of the test. If any question is found missing in the serial order, it should be immediately brought to the notice of the Invigilator. No pages should be torn out from this question booklet.

8. Answers must be marked in the OMR response sheet which is provided separately. OMR Response sheet must be handed over to the invigilator before you leave the seat.

9. The OMR response sheet should not be folded or wrinkled. The folded or wrinkled OMR/response Sheet will not be evaluated.

10. Write your Roll Number in the appropriate space (above) and on the OMR Response Sheet. Any other details, if asked for, should be written only in the space provided.

11. There are four options to each question marked A, B, C and D. Select one of the most appropriate option and fill up the corresponding oval/circle in the OMR Response Sheet provided to you. The correct procedure for filling up the OMR Response Sheet is mentioned below.

12. Use Black or Blue Ball Pen only for filling the ovals/circles in OMR Response Sheet. Darken the selected oval/circle completely. If the correct answer is 'B', the corresponding oval/circle should be completely filled and darkened as shown below.

CORRECT METHOD

WRONG METHOD
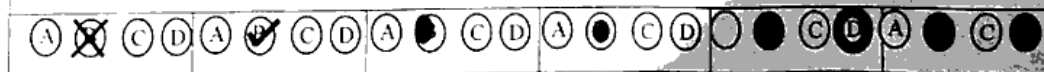
1. What is the process of producing electric dipoles inside the dielectric by an external electric field?
A Polarisation
B Dipole moment
C Susceptibility
D Magnetisation

2. Which of the following restricts the flow of electrical energy?
A Superconductors
B Passive dielectrics
C Molecules
D Active dielectric

3. Which of the following breakdowns occur at higher temperature?
A Avalanche breakdown
B Thermal breakdown
C Electrochemical breakdown
D Dielectric breakdown

4. $\lim x \to 1 \quad (x-1)Tan(\pi x/2)$ is
A 0
B $-1/\pi$
C $-2/\pi$
D $2/\pi$

5. Necessary Conditions of Sandwich rule is
A All functions must have common domain.
B All functions must have common range.
C All functions must have common domain and range both.
D Function must not have common domain and range.

6. Value of $[dSin(x)Cos(x)] / dx$ is
A $Cos(2x)$
B $Sin(2x)$
C $Cos2(2x)$
D $Sin2(2x)$

7. The del operator is called as
A Gradient
B Curl
C Divergence
D Vector differential operator

8. Identify the correct vector identity.
A $i.i=j.j=k.k=0$
B $i \times j = j \times k = k \times i = 1$
C $Div (u \times v) = v . Curl (u) - u . Curl (v)$
D $i.j=j.k=k.i=1$

9. When a vector is irrotational, which condition holds good?
A Stoke's theorem gives non-zero value
B Stoke's theorem gives zero value
C Divergence theorem is invalid
D Divergence theorem is valid

10. The angular separation between the vectors $A = 4i + 3j + 5k$ and $B = i - 2j + 2k$ is (in degrees)
A 65.8
B 66.8
C 67.8
D 68.8

11. Which of the following term isn't a part of the total current density in a semiconductor?
A Temperature
B μ
C e
D E

12. Calculate the recombination rate if the excess carrier concentration is $10^{14} cm^{-3}$ and the carrier lifetime is 1µsecond.
A 10^8
B 10^{10}
C 10^{20}
D 10^{14}

13. Which of the following is used as the recombination agent by semiconductor device manufacturers?
A Silver
B Gold
C Platinum
D Aluminium

14. The change in the carrier density is due to
A Flow of incoming flux
B Flow of outgoing flux
C Difference of flow between incoming and outgoing flux
D Difference of flow between incoming and outgoing flux plus generation and minus recombination

15. Which of the following parameters can't be found with Hall Effect?
A Polarity
B Conductivity
C Carrier concentration
D Area of the device

16. What is the velocity when the electric field is 5 V/m and the magnetic field is 5 A/m?
A 1m/s
B 25m/s
C 0.2m/s
D 0.125m/s

17. Calculate the Hall voltage when B=5 A/m, I=2A, w=5 cm and $n=10^{20}$.
A 3.125V
B 0.3125V
C 0.02V
D 0.002V

18. The displacement of the charges results in
A Magnetic field
B Electric field
C Rust
D Hall effect

19. Which of the following options doesn't define for the necessity for the existence of the potential barrier?
A Contact
B Potential
C Diffusion
D Fermi dirac

20. The un-neutralised ions in the neighborhood of the junction are known as
A Depletion charges
B Uncovered charges
C Mobile ions
D Counter ions

21. Energy given to nucleus to dismantle it increases the
A kinetic energy of individual nucleons
B mechanical energy of individual nucleons
C potential energy of individual nucleons
D chemical energy of individual nucleons

22. Radioactive decay is a
A random process
B non-spontaneous process
C regular process
D massive process

23. In gamma emission, change in nucleon number is
A zero
B definite
C increase by 1
D decreases by 1

24. At higher energy, bodies have
A small mass
B large mass
C zero mass
D smaller weight

25. Most stable isotope in nature is of
A iron-56
B carbon-12
C uranium-235
D uranium-238

26. Total amount of mass and energy together in a system is
A   increasing
B   decreasing
C   zero
D   constant

27. Process by which energy is released in sun is
A   Fission
B   Haber's process
C   Fusion
D   Radioactivity

28. Minimum energy required to pull nucleus apart is called
A   ionization energy
B   electron affinity
C   chemical energy
D   binding energy

29. As compared to proton, mass of neutron is
A   10% greater
B   5% greater
C   1% greater
D   0.1% greater

30. Temperature is a property which determines
A   How much heat a body contains
B   Whether a body will feel hot or cold to touch
C   In which direction heat will flow between two systems
D   How much total absolute energy a body has

31. The performance characteristics of multimode graded index fibers are
A   Better than multimode step index fibers.
B   Same as multimode step index fibers.
C   Lesser than multimode step index fibers
D   Negligible

32. The fibers mostly not used nowadays for optical fiber communication system are
A   Single mode fibers
B   Multimode step fibers
C   Coaxial cables
D   Multimode graded index fibers

33. Which statistics are used for calculations of strengths of optical fibers?
A   Edwin statistics
B   Newton statistics
C   Wei-bull statistics
D   Gamma statistics

34. The distance of the conductor when the area and length of the conductor is $24m^2$ and 13.56m.
A   1.76
B   2.67
C   1.52
D   2.15

[M.Sc. Electronics]

2018

35. Coulomb law is employed in
A Electrostatics
B Magnetostatics
C Electromagnetics
D Maxwell theory

36. Two charges 1C and -4C exists in air. What is the direction of force?
A Away from 1C
B Away from -4C
C From 1C to -4C
D From -4C to 1C

37. A charge of 2×10^{-7} C is acted upon by a force of 0.1N. Determine the distance to the other charge of 4.5×10^{-7} C, both the charges are in vacuum.
A 0.03
B 0.05
C 0.07
D 0.09

38. Rayleigh-Jean's law hold good for which of the following?
A Shorter wavelength
B Longer wavelength
C High temperature
D High energy

39. What is Compton shift?
A Shift in frequency
B Shift in charges
C Shift in radiation
D Shift in wavelength

40. Calculate the de-Broglie wavelength of an electron which has been accelerated from rest on application of potential of 400volts.
A 0.1653 Å
B 0.5125 Å
C 0.6135 Å
D 0.2514 Å

41. Which of the following property of matrix multiplication is correct?
A Multiplication is not commutative in general
B Multiplication is associative
C Multiplication is distributive over addition
D All of the mentioned

42. If for a square matrix A, $A^2 = A$ then such a matrix is known as:
A Idempotent matrix
B Orthogonal matrix
C Null matrix
D None of the mentioned

43. For matrix A, B if A − B = O, where O is a null matrix then

A   A = O
B   B = O
C   A = B
D   None of the mentioned

44. All the diagonal elements of a skew-symmetric matrix is:

A   0
B   1
C   2
D   Any integer

45. If A is "001100" and B is "010101" then A (Ex-or) B is

A   000000
B   111111
C   001101
D   011001

46. What is the dual of (A ∧ B) ∨ (C ∧ D)?

A   (A ∨ B) ∨ (C ∨ D)
B   (A ∨ B) ∧ (C ∨ D)
C   (A ∨ B) ∨ (C ∧ D)
D   (A ∧ B) ∨ (C ∨ D)

47. Which states get filled in the conduction band when the donor-type impurity is added to a crystal?

A N_a
B N_d
C   N
D   P

48. Which of the following parameter describes the best movement of the electrons inside a semiconductor?

A   Velocity gradient
B   Diffusion
C   Mobility
D   Density gradient

49. What is the electric field when the voltage applied is 5V and the length is 100cm?

A   0.5V/m
B   5V/m
C   50V/m
D   None

50. Calculate the average random thermal energy at T=300K?

A   0.038eV
B   3.8eV
C   38eV
D   0.38eV

51. During reverse bias, a small current develops known as
A Forward current
B Reverse current
C Reverse saturation current
D Active current

52. In a p-n junction, the valence band edge of the p material is greater than which of the following band?
A Conduction band edge of n material
B Valence band edge of n material
C Conduction band edge of p material
D Fermi level of p material

53. What does I_{np} represent?
A Hole current in n region
B Hole current in p region
C Electron current in n region
D Electron current in p region

54. Field effect transistors are different from BJTs in that they are _____
A monopolar devices
B bipolar devices
C bidirectional device
D none of the mentioned

55. Advantage of using GaAs in MESFET as compared to use of silicon is:
A GaAs are cost effective
B They have higher mobility
C They have high resistance for flow of current in the reverse direction
D None of the mentioned

56. The frequency of operation of an FET is limited by:
A drain to source voltage
B gate to source voltage
C gate length
D effective area of an FET

57. High-power circuits generally use higher values of:
A gate to source current
B drain to source current
C drain current
D gate to source voltage

58. Choose the correct statement
A MOSFET is a unipolar, voltage controlled, two terminal device
B MOSFET is a bipolar, current controlled, three terminal device
C MOSFET is a unipolar, voltage controlled, three terminal device
D MOSFET is a bipolar, current controlled, two terminal device

59. The controlling parameter in MOSFET is
A V_{ds}
B I_g
C V_{gs}
D I_s

[M.Sc. Electronics]

2018

60. In the transfer characteristics of a MOSFET, the threshold voltage is the measure of the
A   minimum voltage to induce a n-channel/p-channel for conduction
B   minimum voltage till which temperature is constant
C   minimum voltage to turn off the device
D   none of the above mentioned is true

61. The Fahrenheit and centigrade scales agree to
A   40
B   15.5
C   273
D   98.6

62. According to Pascal's law the pressure of gas in a vessel is
A   Different in different direction
B   Same in all direction
C   Same only along opposite directions
D   Same only along normal directions

63. Which one is not an example of adiabatic process?
A   rapid escape of air from a burst tyre
B   rapid expansion of air
C   conversion of water into ice in refrigerator
D   cloud formation in the atmosphere

64. If the volume of a gas is held constant and we increase its temperature then
A   its pressure is constant
B   its pressure rises
C   its pressure falls
D   any of above

$$PV = nRT$$
$$\frac{PV}{T} \qquad P = \frac{nRT}{V}$$
$$V = \frac{nRT}{P} \qquad , \qquad V = \text{constant} , \ T\uparrow$$

65. Which of the following properties of molecules of a gas is same for all gases at particular temperature?
A   momentum
B   mass
C   velocity
D   kinetic energy

66. Which quantity is a state function?
A   internal energy
B   heat supply
C   pressure
D   volume

67. The work done in the isochoric process is
A   constant
B   variable
C   zero
D   depends on situation

68. In an open system, for maximum work, the process must be entirely
A   irreversible
B   reversible
C   adiabatic
D   none of the mentioned

69. A piston cylinder contains 0.5 kg of air at 500 kPa and 500 K. The air expands in a process so pressure is linearly decreasing with volume to a final state of 100 kPa and 300 K. Find the work in the process.
A   56.1 kJ
B   66.1 kJ
C   76.1 kJ
D   86.1 kJ

70. The enthalpy of a substance (denoted by h), is defined as
A   h=u-pv
B   h=u+pv
C   h=-u+pv
D   h=-u-pv

71. In a BJT, if the collector-base junction is reverse-biased and the base-emitter junction is forward-biased, which region is the BJT operating in?
A   Saturation region
B   Active region
C   Cutoff region
D   None of the mentioned

72. Which of the following correctly determines the relation between α and β?
A $\beta=\alpha/(1-\alpha)$
B $\alpha=\beta/(1-\alpha)$
C $\beta=\alpha/(1-\beta)$
D   None of the mentioned

73. For common emitter configuration, which of the following is the correct relation?
A $I_C < I_E$
B $I_C = \beta I_B$
C $I_C = \alpha I_E$
D   All of the mentioned

74. In a pnp-BJT, when the E-B junction is forward biased and no voltage is applied across C-B junction, what happens to the width of the depletion region in the E-B junction?
A   Increases
B   Decreases
C   Remains same
D   Can't be determined

75. Which of the following current in a BJT is also called leakage current?
A I_C
B I_E
C I_{CO}
D I_{CBO}

[M.Sc. Electronics]

2018

76. When does an equation of state reduce to the ideal gas equation?
A when the pressure approaches zero
B when the temperature approaches infinity
C both of the mentioned
D none of the mentioned

77. When does the compressibility factor take the value 1?
A for an ideal gas
B when pressure approaches zero
C when temperature approaches infinity
D all of the mentioned

78. Successive dark and bright fringes are formed each time the moveable mirror in Michelson's interferometer is moved a distance
A $\lambda/2$
B $\lambda/4$
C λ
D $3\lambda/2$

79. Phase difference (Φ) and path difference (δ) are related by $\Phi =$ $k\delta$ $= \frac{2\pi}{\lambda}\delta$
A $2\pi\,\delta/\lambda$
B $\pi\,\delta/\lambda$
C $\pi\,\delta/2\lambda$
D none of the above

80. The condition for constructive interference is path difference should be equal to
A Odd integral multiple of wavelength
B Integral multiple of wavelength
C Odd integral multiple of half wavelength
D Integral multiple of half wavelength

81. The penetration of waves into the regions of the geometrical shadow is
A Dispersion
B Polarization
C Diffraction
D Interference

82. The fringe width (β) of the interference pattern in the Young's double slit experiment decreases _____ distance between the two slits. $\beta = \frac{\lambda D}{2d}$
A with increase in
B With decrease in
C independent of
D none of these

83. Diffraction effect is predominant when
A Size of the obstacle is less than the wavelength of light
B Size of the obstacle is nearly equal to the wavelength of light
C Size of the obstacle is greater than the wavelength of light
D None

84. Which among the following is provided by an optical receiver for the regeneration of data signal with minimum error?

A Photo-diode
B Signal Processing Circuits
C Linear Circuitry
D None of the above

85. Which among the following is regarded as an inelastic scattering of a photon?

A Kerr Effect
B Raman Effect
C Hall Effect
D Miller Effect