Code No.	V – 2353

Entrance Examination for Admission to the P.G. Courses in the Teaching Departments, 2025

CSS

ELECTRONICS (OPTO ELECTRONICS/ARTIFICIAL INTELLIGENCE)

For office use only

General Instructions

1. The Question Paper is having 100 Objective Questions, each carrying one mark.
2. The answers are to be (✓) 'tick marked' **only** in the "**Response Sheet**" provided.
3. **Negative marking** : **0.25 marks** will be deducted for each wrong answer .

Time : 2 Hours **Max. Marks : 100**

To be filled in by the Candidate									
Register Number	in Figures								
	in words								

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Choose appropriate answer from the options in the questions.

(100 × 1 = 100 marks)

1. Silicon is a
   A. Metal
   B. Direct bandgap semiconductor
   C. Indirect bandgap semiconductor
   D. Semi-metal

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2. Faraday's law is expressed by the following Maxwell's equation

A. $\nabla \cdot E = \frac{\rho}{\varepsilon_0}$

B. $\nabla \cdot B = \frac{\partial E}{\partial t}$

C. $\nabla \times B = -\frac{\partial E}{\partial t}$

D. $\nabla \times E = -\frac{\partial B}{\partial t}$

3. Energy of a photon of wavelength λ is

A. $\frac{hc}{\lambda}$

B. $\frac{h\lambda}{c}$

C. $hc\lambda$

D. $\frac{\lambda}{hc}$

4. When a current I passes through a resistor of resistance R, the power dissipation is

A. IR^2 B. I^2R

C. IR D. I/R

5. An oscillator with Q factor 1/2 is

A. Underdamped B. Critically damped

C. Resonating D. Overdamped

6. Experimental evidence of light as a quantum of energy was given by

A. Interference B. Photoelectric effect

C. Diffraction D. Polarization

7. The capacitance of a parallel plate capacitor is

A. Proportional to the distance between the plates

B. Inversely proportional to the area of the plates

C. Proportional to the area of the plates

D. Inversely proportional to the charge stored in the capacitor

8. An electron with velocity v passing through a magnetic field B experiences a force $F =$

A. $q(v \cdot B)$ B. $(q \times v) \cdot B$

C. $q(v \times B)$ D. qB/v

9. Fick's law of diffusion states that the flux density of particles through unit area is

A. Inversely proportional to the temperature

B. Proportional to the time of diffusion

C. Inversely proportional to the concentration

D. Proportional to the gradient of concentration.

10. The de Broglie wavelength of an electron with mass m and velocity v is given by

A. $\frac{h}{mv^2}$ B. $\frac{h}{mv}$

C. $\frac{h}{m^2v^2}$ D. $\frac{hv}{m}$

11. Raman effect is caused by

A. Absorption of light by molecules

B. Magnetic moments of the vibrating molecules

C. Electronic excitation of molecules by incident light

D. Scattering of light by vibrating molecules

12. The reverse saturation current of a p-n junction diode is due to

A. The minority carriers diffusing through the junction

B. The majority carriers drifting through the junction

C. The minority carriers drifting through the junction

D. The majority carriers undergoing avalanche effect

13. Zener breakdown of a p-n junction Zener diode is due to

A. The avalanche multiplication of carriers through the junction

B. Thermal breakdown of the junction

C. Impact ionization of carriers from p-region to n-region

D. Tunnelling of carriers from p-region to n-region

14. If the refractive index of a medium is 1.5, the velocity of light in that medium will be

A. 3×10^8 m/s

B. 4.5×10^8 m/s

C. 1×10^8 m/s

D. 2×10^8 m/s

15. For total internal reflection to occur

A. Light must travel from a higher refractive index medium to a lower refractive index medium

B. The angle of incidence must be smaller than the critical angle

C. Refractive indices of the media should be the same

D. Light must travel from lower refractive index medium to higher refractive index medium

16. The Poynting vector of an electromagnetic radiation is given by

A. $\frac{1}{\mu}E \times B$ B. $\frac{1}{\varepsilon}E \times B$

C. $\mu(E \times B)$ D. $\mu\frac{E}{B}$

17. The substrate of an n-MOSFET is

A. P-type B. N-type

C. Insulator D. Metal

18. The cut-off frequency of a MOSFET with channel length L is

A. Proportional to L B. Proportional to L^2

C. Proportional to $1/L^2$ D. Independent of L

19. The original Moore's law states that

A. The number of transistors in an IC will double every 6 months

B. The number of transistors in an IC will double every year

C. The number of transistors in an IC will become 3 times every year

D. The number of transistors in an IC will remain the same every year

20. The band-gap of silicon at room temperature is

A. 1.1 eV B. 2.3 eV

C. 0.7 eV D. 0 eV

21. Doping with boron, silicon becomes

A. Insulator B. N-type

C. P-type D. None of the above

22. The maximum efficiency of a half-wave rectifier is

A. 100% B. 64.3%

C. 40.6% D. 24.4%

23. The phase difference introduced by a quarter waveplate between the two orthogonal components of linearly polarized light is

A. π B. $\pi/2$

C. $\pi/4$ D. 2π

24. The mobility of electrons in a material can be measured using

A. Raman effect
B. Hall effect
C. Electron microscope
D. Kerr effect

25. The binary equivalent of digit 9 is

A. 1001
B. 1101
C. 1011
D. 1000

26. A system where the valence band and conduction band are overlapping is a

A. Semiconductor
B. Insulator
C. Metal
D. None of the above

27. Charge stored in a capacitor of 1 nF at a voltage of 2 V is

A. 1 nC
B. 2 nC
C. 0.5 nC
D. 0 nC

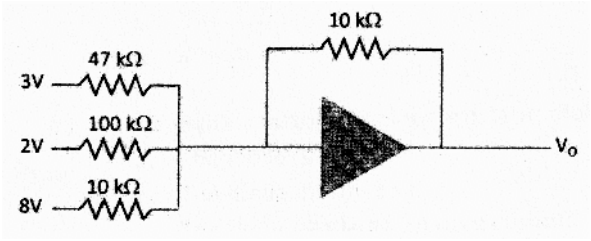
28. Newton per square meter is

A. Farad
B. Coulomb
C. Torr
D. Pascal

29. The amount of energy required for an electron to jump out a metal is termed as

A. Fermi energy
B. Work function
C. Valence band
D. Conduction band

30. The output voltage of the scaling adder in figure shown below is



A. 8.84 V
B. 1.31 V
C. –8.84 V
D. –1.31 V

31. The kinetic energy of an electron with mass m and momentum p is

A. $\frac{p^2}{2m}$ B. $\frac{mp^2}{2}$

C. $\frac{m^2p^2}{2}$ D. $\frac{mp}{2}$

32. The electric field in the depletion region of a p-n junction diode is

A. Positive B. Negative

C. Zero D. None of the above

33. The probability that an electron with a mean free time t_0 in a semiconductor remains unscattered for a time t is proportional to

A. $\text{Ln}(t/t_0)$ B. $\text{Sin}(t/t_0)$

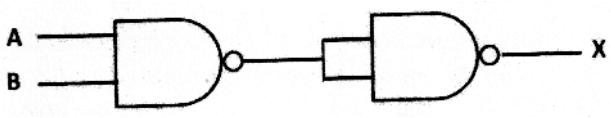
C. $\text{Exp}(-t/t_0)$ D. $\text{Exp}(t/t_0)$

34. The velocity of an electron in a material is proportional to the electric field applied. The proportionality constant is called

A. Susceptibility B. Permittivity

C. Mobility D. Permeability

35. The output (X) of the logic circuit shown below is



A. $X = \overline{A \cdot B}$ B. $X = \overline{A + B}$

C. $X = \overline{\overline{A} \cdot \overline{B}}$ D. $X = A \cdot B$

36. A large ideality factor of a diode indicates that

A. The diode is ideal

B. The diode is non-ideal

C. The diode has large forward current

D. The knee voltage of the diode is zero

37. Electric field E is defined as

A. $-\frac{dV}{dx}$ B. $-\frac{dV}{dt}$

C. $-\frac{dV}{dR}$ D. $\frac{dV}{dt}$

38. An LC tuned circuit with L = 50 μH and C = 100 pF. The frequency of oscillation is

A. 375 kHz B. 2250 kHz

C. 1339 kHz D. 0 Hz

39. The applied input ac power to a half-wave rectifier is 100 watts. The dc output power obtained is 50 watts. Rectification efficiency is

A. 40% B. 50%

C. 60% D. 100%

40. A transformer with a turn ratio of 10:1 is connected to a line of R.M.S voltage 230 V. The secondary peak voltage will be

A. 32.53 V B. 23 V

C. 57.42 V D. 16.44 V

41. A half-wave rectifier supplies 50 V dc to a resistive load of 800 Ω. The diode has a resistance of 25 Ω. The ac voltage required is

A. 50 V B. 246 V

C. 162 V D. 98.7 V

42. In common base connection of a common base transistor, the emitter current is 1 mA and collector current is 0.95 mA. The base current will be

A. 1.95 mA B. 0.05 mA

C. 1 mA D. 0.95 mA

43. Increasing the temperature, the resistance of a semiconductor

A. Increases B. Decreases

C. Remains the same D. Become zero

44. A JFET has I_{DSS} = 32 mA; V_{GS} (off) = –8 V; V_{GS} = –4.5 V. The value of drain current is

A. 3.14 mA B. 5.23 mA

C. 6.12 mA D. 8.25 mA

45. If 5 C charge flows through a wire in 5 minutes, the current through the wire is

A. 1 A B. 112 mA

C. 54 mA D. 17 mA

46. When an electron jumps from higher orbit to a lower orbit, it

A. Absorbs energy

B. Emits energy

C. Sometimes emits, sometimes absorbs energy

D. None of the above

47. In a common base connection, I_C = 0.95 mA and I_B = 0.05 mA. The value of α is

A. 1 B. 0.9

C. 19 D. 0.95

48. 100°C is ———————— Kelvin.

A. 373.15 B. 273.14

C. 432.16 D. 1

49. When the Power gain of an amplifier is 100, the gain in db is

A. 10 B. 20

C. 30 D. 100

50. The device that exhibits negative resistance region is

A. Diac B. Triac

C. Transistor D. UJT

51. A resistor has colour code bands, Yellow, violet, black and gold, its nominal value is

A. $47 \pm 5\%\ \Omega$ B. $100 \pm 20\%\ k\Omega$

C. $7 \pm 5\%\ k\Omega$ D. $560 \pm 10\%\ k\Omega$

52. If the dc output voltage is 400V with no-load attached to power supply but decreases to 300V at full-load, the percentage voltage regulation is

A. 75% B. 133.3%

C. 33.33% D. 12%

53. Graded index optical fibers have

A. The refractive index of the core gradually decreases from the center to the edge

B. The refractive index of the core gradually increases from the center to the edge

C. The refractive index of the core from the center to the edge remains the same

D. None of the above

54. There is a variation of 10 μV in the output voltage when the input voltage is 5V. The value of line regulation is

A. 5 μV/V B. 2 μV/V

C. 50 μV/V D. 0.5 μV/V

55. The refractive indices of the core and cladding of an optical fiber are 1.5 and 1.2 respectively. The numerical aperture of the fiber is

A. 0.22 B. 0.43

C. 0.56 D. 0.75

56. The wavelength of a He-Ne laser is

A. 532 nm B. 455.2 nm

C. 256.4 nm D. 632.8 nm

57. Bragg's law of X-ray diffraction is expressed as

A. $n\lambda = 2d\sin\theta$ B. $nd = 2\lambda\sin\theta$

C. $n\lambda = \sin\theta / 2d$ D. $d = n\lambda\sin\theta$

58. One of the closest packing of atoms in a crystal is

A. Monoclinic B. Simple cubic

C. Tetragonal D. Hexagonal

59. When a reverse gate voltage of 15 V is applied to a JFET, the gate current is 10^{-3} μA. The resistance between gate and source is

A. 15 MΩ
B. 150 MΩ
C. 1.5 GΩ
D. 15 GΩ

60. Photoelectric effect gives

A. Conductivity of the metal
B. Electron mobility of the metal
C. Work function of the metal
D. Bandgap of a semiconductor

61. The angle of incidence of a light on a prism is 45° and the angle of refraction is 30°. The refractive index of the prism is

A. 1.52
B. 1.41
C. 1.62
D. 1

62. The first Brillouin zone in a crystal of lattice constant *a* is at

A. $\pm \pi a$
B. $\pm \pi / a$
C. $\pm a / \pi$
D. $\pm a / 2\pi$

63. The bending of light when it passes from one medium to another is called

A. Diffraction
B. Reflection
C. Total internal reflection
D. Refraction

64. When the reverse bias voltage across a p-n junction increases, the width of the depletion region

A. Increases
B. Reduces
C. Remains the same
D. None of the above

65. An object is placed in front of a concave mirror of focal length 20 cm. The image formed is three times the size of the object. The distance of the object from the mirror is

A. 6.67 cm
B. 13.33 cm
C. 32.26 cm
D. 48.36 cm

66. When a metal is heated, electrons jumps out. This phenomenon is

A. Photoelectric effect
B. Thermionic emission
C. Piezoelectric effect
D. Triboelectric effect

67. The Fourier transform of a Gaussian function is

A. Lorentzian function
B. Linear function
C. Gaussian function
D. Quadratic function

68. 600 waves with speed of 1000 m/s passes through a medium in 1 minute. The wavelength of the wave is

A. 25 m
B. 50 m
C. 100 m
D. 200 m

69. The density of states of a three dimensional free electron gas is proportional to energy E as

A. $\sqrt{E}$
B. $E^3/2$
C. E^2
D. E

70. Which one of the following is not an example of uncertainty principle?

A. Momentum and velocity
B. Position and momentum
C. Energy and time
D. Angle and angular momentum

71. Which of the following represent simple harmonic motion?

A. $x = A\sin\omega t + B\cos\omega t$
B. $x = A\sin\omega t + B\cos 2\omega t$
C. $x = Ae^{i\omega t}$
D. $x = A\ln\omega t$

72. When a mechanical stress is applied on a material, voltage develops across the orthogonal sides. This effect is called

A. Hall effect
B. Piezoelectric effect
C. Triboelectric effect
D. Pyroelectric effect

73. The Fermi level of silicon doped with phosphorous lies

A. At the middle of the band gap

B. Closer to the valence band

C. Closer to the conduction band

D. Within the overlap of valence and conduction bands

74. The quantum narrative of the origin of the band gap in a semiconductor was first given by

A. Lorentz-Drude model

B. Boss-Einstein model

C. Kronig-Penney model

D. Fermi-Dirac model

75. Photons are classified as

A. Charged particles

B. Fermions

C. Mesons

D. Bosons

76. Kinetic energy of a free electron at 300 K is approximately

A. 26 meV

B. 52 meV

C. 104 meV

D. 1 eV

77. Distribution of electrons follows

A. Maxwell-Boltzmann statistics

B. Fermi-Dirac statistics

C. Bose-Einstein statistics

D. None of the above

78. Which condition is shown in J-K flip flop as no changes next stage from the present stage?

A. J = 0, K = 0

B. J = 0, K = 1

C. J = 1, K = 0

D. J = 1, K = 1

79. D flip flop can be made from a J-K flip flop by making

A. J = K

B. J = K = 1

C. J = 0, K = 1

D. $J = \overline{K}$

80. Intrinsic silicon has 10^{10} free electrons per cubic centimetre. If this silicon is doped with 10^{15} phosphorous, the number of holes in the silicon will be

A. 10^{10} B. 10^{5}

C. 10^{2} D. 10

81. In CMOS, 7 nm technology refers to

A. Total transistor size B. Gate thickness

C. Channel length D. Electron tunnelling distance

82. The equivalent of binary 1111 in hexadecimal is

A. 5 B. C

C. D D. F

83. Which of the following methods is used to identify the doping type (n or p) of a semiconductor?

A. X-ray diffraction B. Raman effect

C. Hall effect D. Absorption spectroscopy

84. The reduced form of the Boolean expression $ABCD + ABC\overline{D} + \overline{A}BCD + \overline{A}BC\overline{D}$ is

A. ABCD B. AD

C. ABC D. BC

85. To generate stimulated emissions, we need

A. Defect levels B. Trap centers

C. Metastable states D. Superconducting states

86. The number of Bravais lattices in crystal systems is

A. 6 B. 12

C. 14 D. 21

87. A wave of the form $V = A\sin(\omega t + \varphi \sin \omega_m t)$ represents

A. Amplitude modulated wave

B. Phase modulated wave

C. Frequency modulated wave

D. Unmodulated wave

88. The minimum attenuation of light through an optical fiber is

A. 1.2 dB/km

B. 0.62 dB/km

C. 0.16 dB/km

D. 0 dB/km

89. Rayleigh scattering law states that the intensity of scattered light with wavelength λ is proportional to

A. $1/\lambda^4$

B. $1/\lambda^2$

C. $1/\lambda$

D. λ^3

90. The complete expulsion of magnetic field from a superconducting material is called

A. London effect

B. Meissner effect

C. Landauer effect

D. Lorentz effect

91. Ideally, the degree of freedom of charge carriers in a quantum dot is

A. Zero

B. One

C. Two

D. Three

92. The characteristic impedance of a coaxial wire of inner and outer diameters d and D, separated by a dielectric of dielectric constant k is

A. $138k \log\frac{D}{d}$

B. $\frac{138}{k}\log\frac{D}{d}$

C. $\frac{138}{k^2}\log\frac{D}{d}$

D. $\frac{138}{\sqrt{k}}\log\frac{D}{d}$

93. When a voltage is applied, sharp metal objects initiate spark at a lower voltage compared to flat surfaces. This is explained using

A. Faraday's law
B. Gauss' law
C. Bernoulli's theorem
D. Ehrenfest's theorem

94. The electric field inside a charged conducting hollow sphere is

A. Infinity
B. Unity
C. Can not be measured
D. Zero

95. Sound waves travels through a crystal by means of

A. Photons
B. Phonons
C. Defects
D. Electrons

96. Which of the following is not an optoelectronic device?

A. Photodetector
B. Solar cell
C. LED
D. Zener diode

97. The symbol 

represents

A. Photodiode
B. Zener diode
C. Memristor
D. Solar cell

98. Cathode rays are

A. Electrons
B. Protons
C. Neutrinos
D. Photons

99. Maximum power point of a solar cell is obtained at

A. The product of current and voltage is maximum
B. The product of short-circuit current at corresponding voltage
C. The product of open circuit voltage and the corresponding current
D. None of the above

100. Which one of the following is not the property of a laser?

A. Monochromaticity
B. Coherence
C. Divergence
D. Directionality

———————

RESPONSE SHEET

1	A	B	C	D	E	26	A	B	C	D	E	51	A	B	C	D	E	76	A	B	C	D	E
2	A	B	C	D	E	27	A	B	C	D	E	52	A	B	C	D	E	77	A	B	C	D	E
3	A	B	C	D	E	28	A	B	C	D	E	53	A	B	C	D	E	78	A	B	C	D	E
4	A	B	C	D	E	29	A	B	C	D	E	54	A	B	C	D	E	79	A	B	C	D	E
5	A	B	C	D	E	30	A	B	C	D	E	55	A	B	C	D	E	80	A	B	C	D	E
6	A	B	C	D	E	31	A	B	C	D	E	56	A	B	C	D	E	81	A	B	C	D	E
7	A	B	C	D	E	32	A	B	C	D	E	57	A	B	C	D	E	82	A	B	C	D	E
8	A	B	C	D	E	33	A	B	C	D	E	58	A	B	C	D	E	83	A	B	C	D	E
9	A	B	C	D	E	34	A	B	C	D	E	59	A	B	C	D	E	84	A	B	C	D	E
10	A	B	C	D	E	35	A	B	C	D	E	60	A	B	C	D	E	85	A	B	C	D	E
11	A	B	C	D	E	36	A	B	C	D	E	61	A	B	C	D	E	86	A	B	C	D	E
12	A	B	C	D	E	37	A	B	C	D	E	62	A	B	C	D	E	87	A	B	C	D	E
13	A	B	C	D	E	38	A	B	C	D	E	63	A	B	C	D	E	88	A	B	C	D	E
14	A	B	C	D	E	39	A	B	C	D	E	64	A	B	C	D	E	89	A	B	C	D	E
15	A	B	C	D	E	40	A	B	C	D	E	65	A	B	C	D	E	90	A	B	C	D	E
16	A	B	C	D	E	41	A	B	C	D	E	66	A	B	C	D	E	91	A	B	C	D	E
17	A	B	C	D	E	42	A	B	C	D	E	67	A	B	C	D	E	92	A	B	C	D	E
18	A	B	C	D	E	43	A	B	C	D	E	68	A	B	C	D	E	93	A	B	C	D	E
19	A	B	C	D	E	44	A	B	C	D	E	69	A	B	C	D	E	94	A	B	C	D	E
20	A	B	C	D	E	45	A	B	C	D	E	70	A	B	C	D	E	95	A	B	C	D	E
21	A	B	C	D	E	46	A	B	C	D	E	71	A	B	C	D	E	96	A	B	C	D	E
22	A	B	C	D	E	47	A	B	C	D	E	72	A	B	C	D	E	97	A	B	C	D	E
23	A	B	C	D	E	48	A	B	C	D	E	73	A	B	C	D	E	98	A	B	C	D	E
24	A	B	C	D	E	49	A	B	C	D	E	74	A	B	C	D	E	99	A	B	C	D	E
25	A	B	C	D	E	50	A	B	C	D	E	75	A	B	C	D	E	100	A	B	C	D	E

ROUGH WORK

ROUGH WORK

ROUGH WORK