Roll No. .....

Question Booklet Number

O. M. R. Serial No.

M. Sc. (Second Semester)

(NEP) EXAMINATION, 2025-26

PHYSICS

(Electronics)

Paper Code							
B	0	1	0	8	0	4	T

Questions Booklet Series
B

Time : 1:30 Hours] [*Maximum Marks : 75*

Instructions to the Examinee :

1. Do not open the booklet unless you are asked to do so.

2. The booklet contains 100 questions. Examinee is required to answer 75 questions in the OMR Answer-Sheet provided and not in the question booklet. All questions carry equal marks.

3. Examine the Booklet and the OMR Answer-Sheet very carefully before you proceed. Faulty question booklet due to missing or duplicate pages/questions or having any other discrepancy should be got immediately replaced.

परीक्षार्थियों के लिए निर्देश :

1. प्रश्न-पुस्तिका को तब तक न खोलें जब तक आपसे कहा न जाए।

2. प्रश्न-पुस्तिका में 100 प्रश्न हैं। परीक्षार्थी को 75 प्रश्नों को केवल दी गई OMR आन्सर-शीट पर ही हल करना है, प्रश्न-पुस्तिका पर नहीं। सभी प्रश्नों के अंक समान हैं।

3. प्रश्नों के उत्तर अंकित करने से पूर्व प्रश्न-पुस्तिका तथा OMR आन्सर-शीट को सावधानीपूर्वक देख लें। दोषपूर्ण प्रश्न-पुस्तिका जिसमें कुछ भाग छपने से छूट गए हों या प्रश्न एक से अधिक बार छप गए हों या उसमें किसी अन्य प्रकार की कमी हो, तो उसे तुरन्त बदल लें।

(Remaining instructions on the last page) **(शेष निर्देश अन्तिम पृष्ठ पर)**

(Only for Rough Work)

1. LED works on the principle of :

(A) Thermal emission

(B) Radiative recombination

(C) Photoelectric effect

(D) Field emission

2. LED materials are generally :

(A) Indirect band-gap semiconductors

(B) Direct band-gap semiconductors

(C) Metals

(D) Insulators

3. Energy of a photon is given by :

(A) $E = mc^2$

(B) $E = hc/\lambda$

(C) $E = kT$

(D) $E = qV$

4. Relation in electron-volt is :

(A) $E = 1240/\lambda(nm)$

(B) $E = \lambda /1240$

(C) $E = hc\lambda$

(D) $E = 1/\lambda^2$

5. A photodiode is normally operated in :

(A) Forward bias

(B) Reverse bias

(C) Zero bias only

(D) AC bias

6. A solar cell converts :

(A) Heat into electricity

(B) Light into electricity

(C) Sound into electricity

(D) Electricity into light

7. Open-circuit voltage of a solar cell occurs at :

(A) Zero current

(B) Zero voltage

(C) Maximum current

(D) Infinite resistance

8. Short-circuit current occurs at :

(A) Zero voltage

(B) Infinite voltage

(C) Zero light

(D) Maximum resistance

9. Fill factor is defined as :

(A) $P_{max} / (V_{oc} I_{sc})$

(B) V_{oc} / I_{sc}

(C) I_{sc} / V_{oc}

(D) P_{max} / V_{oc}

10. Responsivity of a photodetector is measured in :

(A) V/W

(B) A/W

(C) W/A

(D) Ω

11. Avalanche photodiode provides :

(A) No gain

(B) Internal gain

(C) Thermal gain

(D) Optical loss

12. A PIN photodiode contains :

(A) Metal layer

(B) Intrinsic semiconductor layer

(C) Oxide layer

(D) Magnetic layer

13. Radiative transition results in :

(A) Heat generation

(B) Photon emission

(C) Current blocking

(D) Voltage drop

14. Non-radiative recombination produces :

(A) Light

(B) Heat

(C) Sound

(D) Radiation pressure

15. Wavelength of LED emission depends mainly on :

(A) Temperature

(B) Band gap energy

(C) Current only

(D) Device size

16. An optocoupler provides :

(A) Mechanical coupling

(B) Electrical isolation

(C) Thermal conduction

(D) Magnetic shielding

17. Dark current is associated with :

(A) LED

(B) Photodiode without illumination

(C) Resistor

(D) Capacitor

18. If responsivity = 0.5 A/W and incident power = 2 mW, photocurrent is :

(A) 0.5 mA

(B) 1 mA

(C) 2 mA

(D) 5 mA

19. For V_{oc} = 0.6 V, I_{sc} = 3 A, FF = 0.7, maximum power is about :

(A) 0.63 W

(B) 1.26 W

(C) 1.8 W

(D) 3 W

20. Photon energy for wavelength 620 nm is nearly :

(A) 1 eV

(B) 2 eV

(C) 3 eV

(D) 4 eV

21. If band gap = 1.24 eV, emitted wavelength is approximately :

(A) 400 nm

(B) 600 nm

(C) 1000 nm

(D) 1240 nm

22. Doubling LED current approximately :

(A) Halves light output

(B) Doubles light output

(C) Keeps it constant

(D) Makes it zero

23. Surface recombination in LEDs :

(A) Increases efficiency

(B) Reduces efficiency

(C) Has no effect

(D) Stops emission completely

24. A phototransistor mainly provides :

(A) Rectification

(B) Amplification

(C) Oscillation

(D) Modulation

25. Spectral response of a detector depends on :

(A) Band gap

(B) Shape

(C) Pressure

(D) Resistance only

26. Optical fiber works on :

(A) Diffraction

(B) Total internal reflection

(C) Refraction only

(D) Scattering

27. Refractive index of fiber core is :

(A) Less than cladding

(B) Greater than cladding

(C) Equal to cladding

(D) Zero

28. Numerical aperture is :

(A) $\sqrt{n_1^2 - n_2^2}$

(B) n_1/n_2

(C) n_2/n_1

(D) $n_1 + n_2$

29. Acceptance angle relation is :

(A) $\sin\theta = NA$

(B) $\cos\theta = NA$

(C) $\tan\theta = NA$

(D) $\theta = NA^2$

30. Single-mode fiber has :

(A) Large core diameter

(B) Very small core diameter

(C) No core

(D) Metal core

31. Intermodal dispersion occurs in :

(A) Single-mode fiber

(B) Multimode fiber

(C) Vacuum

(D) Copper wire

32. Material dispersion is due to :

(A) Bending loss

(B) Wavelength dependence of refractive index

(C) Scattering only

(D) Temperature only

33. Fiber attenuation is measured in :

(A) dB

(B) dB/km

(C) W/m

(D) Hz

34. Rayleigh scattering varies as :

(A) $\frac{1}{\lambda}$

(B) $\frac{1}{\lambda^2}$

(C) $\frac{1}{\lambda^4}$

(D) λ^2

35. Step-index fiber has :

(A) Gradual index variation

(B) Sharp refractive index change

(C) No cladding

(D) Metal coating

36. Graded-index fiber :

(A) Has uniform index

(B) Has gradually varying core index

(C) Has no dispersion

(D) Works only in UV

37. A common fiber fabrication technique is :

(A) MCVD

(B) Welding

(C) Casting

(D) Rolling

38. Optical source in fiber communication is :

(A) Heater

(B) Laser diode

(C) Transformer

(D) Motor

39. Detector used in fiber link is :

(A) LED

(B) PIN/APD photodiode

(C) Resistor

(D) Capacitor

40. Pulse broadening mainly limits :

(A) Voltage

(B) Bandwidth

(C) Current

(D) Power

41. Bending loss increases when :

(A) Radius increases

(B) Radius decreases

(C) Fiber is straight

(D) Temperature decreases

42. Minimum loss in silica fiber occurs near :

(A) 0.85 μm

(B) 1.3 μm

(C) 1.55 μm

(D) 10 μm

43. Function of cladding is :

(A) Heating

(B) Light confinement

(C) Cooling

(D) Shielding

44. Optical fiber is immune to :

(A) Electromagnetic interference

(B) Gravity

(C) Pressure

(D) Temperature

45. Fiber bandwidth compared to copper cable is :

(A) Lower

(B) Same

(C) Much higher

(D) Zero

46. For $n_1 = 1.5, n_2 = 1.48$, NA $\approx$:

(A) 0.10

(B) 0.17

(C) 0.24

(D) 0.40

47. If NA = 0.25, acceptance angle in air $\approx$:

(A) 14°

(B) 30°

(C) 45°

(D) 60°

48. Fiber loss = 0.2 dB/km over 50 km gives total loss :

(A) 2 dB

(B) 5 dB

(C) 10 dB

(D) 20 dB

49. 10 dB loss means output power becomes :

(A) Same as input

(B) One-tenth of input

(C) Double

(D) Zero

50. Major application of optical fiber is :

(A) Cooking

(B) Telecommunication

(C) Heating

(D) Mechanical power transmission

51. Ideal op-amp input impedance is :

(A) Zero

(B) Infinite

(C) Unity

(D) Low

52. Ideal op-amp output impedance is :

(A) Infinite

(B) High

(C) Zero

(D) Unity

53. Open-loop gain of an ideal op-amp is :

(A) Zero

(B) Unity

(C) Very high

(D) Low

54. Gain of an inverting amplifier is :

(A) $1+R_f / R_{in}$

(B) $-R_f / R_{in}$

(C) R_{in} / R_f

(D) 0

55. Gain of a non-inverting amplifier is :

(A) $-R_f / R$

(B) $1+R_f / R$

(C) R / R_f

(D) 0

56. Phase shift in an inverting amplifier is :

(A) 0°

(B) 90°

(C) 180°

(D) 270°

57. Voltage follower gain is :

(A) 0

(B) 1

(C) – 1

(D) Infinite

58. CMRR is defined as :

(A) A_d / A_c

(B) A_c / A_d

(C) Sum of gains

(D) Product of gains

59. CMRR in dB equals :

(A) 10log CMRR

(B) 20log CMRR

(C) $CMRR^2$

(D) 1/CMRR

60. Slew rate is :

(A) Max rate of change of output voltage

(B) Input resistance

(C) Gain

(D) Bandwidth

61. Gain-bandwidth product of op-amp is :

(A) Constant

(B) Zero

(C) Infinite

(D) Variable only

62. Virtual ground means :

(A) Node at zero potential without physical ground

(B) Open circuit

(C) High voltage node

(D) Floating node

63. Output of ideal integrator is :

(A) $-\frac{1}{RC}\int V dt$

(B) $RC\int V dt$

(C) dV/dt

(D) Constant

64. Output of differentiator is :

(A) $-RC\, dV/dt$

(B) $\int V dt$

(C) Constant

(D) Zero

65. Integrator behaves as :

(A) High-pass filter

(B) Low-pass filter

(C) Band-pass

(D) Oscillator

66. Differentiator behaves as :

(A) Low-pass

(B) High-pass

(C) Band-stop

(D) DC amplifier

67. If $R_f = R_{in}$, gain of inverting amplifier is :

(A) + 1

(B) – 1

(C) 0

(D) Infinite

68. For $R_f = 100\ k\Omega, R_{in} = 10\ k\Omega$, gain is :

(A) – 5

(B) – 10

(C) + 10

(D) + 5

69. For non-inverting amplifier $R_f = 90\ k\Omega$, $R = 10\ k\Omega$ gain is :

(A) 9

(B) 10

(C) 11

(D) – 10

70. Input 0.2 V with gain – 50 gives output :

(A) – 10 V

(B) + 10 V

(C) – 5 V

(D) + 5 V

71. CMRR = 1000 corresponds to :

(A) 20 dB

(B) 40 dB

(C) 60 dB

(D) 80 dB

72. Offset current equals :

(A) Sum of input currents

(B) Difference of input bias currents

(C) Zero

(D) Infinite

73. Ideal op-amp input current is :

(A) Infinite

(B) Zero

(C) High

(D) Variable

74. Ideal op-amp bandwidth is :

(A) Zero

(B) Infinite

(C) Low

(D) Unity

75. A commonly used op-amp IC is :

(A) 555

(B) 741

(C) 7805

(D) 8051

76. Barkhausen criterion requires :

(A) Gain < 1

(B) Gain = 1 and phase = 0°

(C) Gain > 1 only

(D) Phase = 90°

77. Wien bridge oscillator generates :

(A) Square wave

(B) Sine wave

(C) Triangle wave

(D) Pulse

78. Frequency of Wien bridge oscillator is :

(A) $1/2\pi RC$

(B) $2\pi RC$

(C) RC

(D) $1/RC^2$

79. Required gain for Wien bridge oscillation is :

(A) 1

(B) 2

(C) 3

(D) 4

80. Frequency of LC oscillator is :

(A) $1/2\pi\sqrt{LC}$

(B) $2\pi\sqrt{LC}$

(C) RC

(D) $1/RC$

81. RC time constant equals :

(A) R/C

(B) RC

(C) 1/RC

(D) R + C

82. Cut-off frequency of RC filter is :

(A) $2\pi RC$

(B) $1/2\pi RC$

(C) RC

(D) $1/RC^2$

83. Astable multivibrator has :

(A) No stable state

(B) One stable state

(C) Two stable states

(D) Infinite states

84. Monostable multivibrator has :

(A) One stable state

(B) Two stable states

(C) None of the above

(D) Infinite

85. Bistable multivibrator is also called :

(A) Oscillator

(B) Flip-flop

(C) Integrator

(D) Converter

86. Comparator output saturates at :

(A) 0 V

(B) Supply limits

(C) Input voltage

(D) Ground

87. Schmitt trigger introduces :

(A) Hysteresis

(B) Integration

(C) Differentiation

(D) Oscillation

88. Resolution of a 4-bit ADC is :

(A) 1/4

(B) 1/8

(C) 1/16

(D) 1/32

89. Step size of 3-bit ADC with 8 V full scale is :

(A) 0.5 V

(B) 1 V

(C) 2 V

(D) 4 V

90. V/F converter output is :

(A) Voltage $\propto$ frequency

(B) Frequency $\propto$ voltage

(C) Constant

(D) Zero

91. Integrator + comparator generates :

(A) Sine wave

(B) Triangle wave

(C) Square wave

(D) Pulse

92. Crystal oscillator works on :

(A) Piezoelectric effect

(B) Magnetic effect

(C) Thermal effect

(D) Optical effect

93. LC oscillator with L = 10μH, C = 100 *p*F has frequency near :

(A) 1 MHz

(B) 5 MHz

(C) 10 MHz

(D) 50 MHz

94. Wien bridge with $R = 10k\Omega$, $C = 0.01\mu F$ gives frequency :

(A) 160 Hz

(B) 1.6 kHz

(C) 16 kHz

(D) 160 kHz

95. Slew-rate relation for sine wave is :

(A) $SR = 2\pi f V_{max}$

(B) SR = V/f

(C) SR = RC

(D) SR = 1/RC

96. GBW = 1 MHz and gain = 100, bandwidth :

(A) 1 kHz

(B) 10 kHz

(C) 100 kHz

(D) 1 MHz

97. Duty cycle is :

(A) T_{ON}/T

(B) T/T_{ON}

(C) RC

(D) 1/RC

98. Sweep generator produces :

(A) Constant DC

(B) Variable frequency

(C) Noise

(D) Pulse only

99. Symmetrical square wave duty cycle is :

(A) 25 %

(B) 50 %

(C) 75%

(D) 100%

100. Oscillation requires :

(A) Negative feedback

(B) Positive feedback

(C) Zero gain

(D) Infinite loss

(Only for Rough Work)

4. Four alternative answers are mentioned for each question as—A, B, C & D in the booklet. The candidate has to choose the correct answer and mark the same in the OMR Answer-Sheet as per the direction :

Example :

Question :

Q. 1 (A) ● (C) (D)
Q. 2 (A) (B) ● (D)
Q. 3 (A) ● (C) (D)

Illegible answers with cutting and over-writing or half filled circle will be cancelled.

5. Each question carries equal marks. Marks will be awarded according to the number of correct answers you have.
6. All answers are to be given on OMR Answer Sheet only. Answers given anywhere other than the place specified in the answer sheet will not be considered valid.
7. Before writing anything on the OMR Answer Sheet, all the instructions given in it should be read carefully.
8. After the completion of the examination candidates should leave the examination hall only after providing their OMR Answer Sheet to the invigilator. Candidate can carry their Question Booklet.
9. There will be no negative marking.
10. Rough work, if any, should be done on the blank pages provided for the purpose in the booklet.
11. To bring and use of log-book, calculator, pager and cellular phone in examination hall is prohibited.
12. In case of any difference found in English and Hindi version of the question, the English version of the question will be held authentic.

Impt. : On opening the question booklet, first check that all the pages of the question booklet are printed properly. If there is any discrepancy in the question Booklet, then after showing it to the invigilator, get another question Booklet of the same series.

4. प्रश्न-पुस्तिका में प्रत्येक प्रश्न के चार सम्भावित उत्तर—A, B, C एवं D हैं। परीक्षार्थी को उन चारों विकल्पों में से सही उत्तर छाँटना है। उत्तर को OMR आन्सर-शीट में सम्बन्धित प्रश्न संख्या में निम्न प्रकार भरना है :

उदाहरण :

प्रश्न :

प्रश्न 1 (A) ● (C) (D)
प्रश्न 2 (A) (B) ● (D)
प्रश्न 3 (A) ● (C) (D)

अपठनीय उत्तर या ऐसे उत्तर जिन्हें काटा या बदला गया है, या गोले में आधा भरकर दिया गया, उन्हें निरस्त कर दिया जाएगा।

5. प्रत्येक प्रश्न के अंक समान हैं। आपके जितने उत्तर सही होंगे, उन्हीं के अनुसार अंक प्रदान किये जायेंगे।
6. सभी उत्तर केवल ओ. एम. आर. उत्तर-पत्रक (OMR Answer Sheet) पर ही दिये जाने हैं। उत्तर-पत्रक में निर्धारित स्थान के अलावा अन्यत्र कहीं पर दिया गया उत्तर मान्य नहीं होगा।
7. ओ. एम. आर. उत्तर-पत्रक (OMR Answer Sheet) पर कुछ भी लिखने से पूर्व उसमें दिये गये सभी अनुदेशों को सावधानीपूर्वक पढ़ लिया जाये।
8. परीक्षा समाप्ति के उपरान्त परीक्षार्थी कक्ष निरीक्षक को अपनी OMR Answer Sheet उपलब्ध कराने के बाद ही परीक्षा कक्ष से प्रस्थान करें। परीक्षार्थी अपने साथ प्रश्न-पुस्तिका ले जा सकते हैं।
9. निगेटिव मार्किंग नहीं है।
10. कोई भी रफ कार्य, प्रश्न-पुस्तिका के अन्त में, रफ-कार्य के लिए दिए खाली पेज पर ही किया जाना चाहिए।
11. परीक्षा-कक्ष में लॉग-बुक, कैलकुलेटर, पेजर तथा सेल्युलर फोन ले जाना तथा उसका उपयोग करना वर्जित है।
12. प्रश्न के हिन्दी एवं अंग्रेजी रूपान्तरण में भिन्नता होने की दशा में प्रश्न का अंग्रेजी रूपान्तरण ही मान्य होगा।

महत्वपूर्ण : प्रश्नपुस्तिका खोलने पर प्रथमतः जाँच कर देख लें कि प्रश्न-पुस्तिका के सभी पृष्ठ भलीभाँति छपे हुए हैं। यदि प्रश्नपुस्तिका में कोई कमी हो, तो कक्षनिरीक्षक को दिखाकर उसी सिरीज की दूसरी प्रश्न-पुस्तिका प्राप्त कर लें।