

Roll. No.

Question Booklet Number

O.M.R. Serial No.

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M.Sc. (SEM.-III) (NEP) (SUPPLE.) EXAMINATION, 2024-25

PHYSICS

[Electronics-I (Elective)]

Paper Code

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**Question Booklet
Series**

A

Time : 1 : 30 Hours

Max. 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.
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 :

(Remaining instructions on last page)

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, उसे तुरन्त बदल लें।
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 छानना है। उत्तर को OMR उत्तर-पत्रक में सम्बन्धित प्रश्न संख्या में निम्न प्रकार भरना है :

(शेष निर्देश अन्तिम पृष्ठ पर)

1. In AM, overmodulation occurs when the modulation index exceeds:
 (A) 0.5 (B) 1.0
 (C) 1.0 (D) 2.0
2. The power efficiency of standard AM is maximized when:
 (A) Carrier power is increased
 (B) Modulation index is 1
 (C) Sidebands are suppressed
 (D) Bandwidth is minimized
3. Which of the following best describes the spectrum of an AM signal?
 (A) Single frequency component
 (B) Carrier plus upper and lower sidebands
 (C) Carrier plus harmonics
 (D) Sidebands only
4. The total transmitted power in AM is given by:
 (A) P_C
 (B) $P_C(1 + mu^2)$
 (C) $P_C(1 + mu)$
 (D) $P_C\left(1 + \frac{mu^2}{2}\right)$
5. Which of the following is NOT a method for AM generation?
 (A) Collector modulation
 (B) Base modulation
 (C) Diode mixing
 (D) Grid modulation
6. An envelope detector fails when:
 (A) Modulation index exceeds 1
 (B) Carrier is strong
 (C) Signal is sinusoidal
 (D) Carrier is suppressed
7. The RC time constant in an envelope detector must be:
 (A) Very small
 (B) Equal to carrier period
 (C) Larger than modulating period
 (D) Between carrier and modulating periods
8. Which distortion arises in envelope detection due to improper filtering?
 (A) Phase distortion
 (B) Diagonal clipping
 (C) Harmonic distortion
 (D) Intermodulation
9. In DSBSC, the transmitted signal contains:
 (A) Carrier only
 (B) Carrier and one sideband
 (C) Both sidebands, no carrier
 (D) Upper sideband only
10. Which mathematical operation best describes DSBSC generation?
 (A) Addition
 (B) Multiplication
 (C) Differentiation
 (D) Integration

11. The bandwidth of a DSBSC signal is:
 - (A) Twice the modulating frequency
 - (B) Half the modulating frequency
 - (C) Equal to modulating frequency
 - (D) Equal to carrier frequency
12. Which of the following circuits is essential for DSBSC generation?
 - (A) Mixer
 - (B) Balanced modulator
 - (C) Envelope detector
 - (D) Phase shifter
13. Coherent detection requires the local oscillator to be:
 - (A) Phase shifted
 - (B) Amplitude modulated
 - (C) Frequency and phase synchronized
 - (D) Frequency modulated
14. If the local oscillator in coherent detection is out of phase, the result is:
 - (A) Amplified signal
 - (B) Attenuated or distorted output
 - (C) Carrier regeneration
 - (D) Sideband suppression
15. Which system is used to maintain phase coherence in receivers?
 - (A) Mixer
 - (B) Envelope detector
 - (C) Integrator
 - (D) Phase-locked loop (PLL)
16. SSB modulation is preferred over DSBSC because:
 - (A) It requires less bandwidth
 - (B) It is easier to generate
 - (C) It has higher power
 - (D) It avoids carrier synchronization
17. Which method is NOT used for SSB generation?
 - (A) Filter method
 - (B) Phase-shift method
 - (C) Envelope detection
 - (D) Weaver's method
18. In the phase-shift method of SSB generation, the key requirement is:
 - (A) Carrier suppression
 - (B) 90° phase shift between signal paths
 - (C) High carrier amplitude
 - (D) Low modulation index

19. The Weaver method avoids:
 - (A) Filtering
 - (B) Mixing
 - (C) Phase shifting
 - (D) Carrier generation
20. SSB detection requires:
 - (A) Coherent detector with carrier recovery
 - (B) Envelope detector
 - (C) Diode rectifier
 - (D) Band-pass filter
21. VSB is used in TV transmission because:
 - (A) It is noise-resistant
 - (B) It allows partial sideband transmission with easier filtering
 - (C) It uses FM
 - (D) It suppresses carrier completely
22. The vestigial sideband is:
 - (A) A full sideband
 - (B) A suppressed carrier
 - (C) A harmonic of the signal
 - (D) A portion of one sideband
23. Which of the following is true for VSB modulation?
 - (A) It transmits both sidebands fully
 - (B) It transmits one full sideband and a vestige of the other
 - (C) It transmits carrier only
 - (D) It transmits upper sideband only
24. The filter used in VSB must have:
 - (A) Gradual roll-off
 - (B) Sharp cutoff
 - (C) High Q-factor
 - (D) Flat response
25. Compared to SSB, VSB offers:
 - (A) Better bandwidth efficiency
 - (B) Higher power efficiency
 - (C) Easier implementation with similar bandwidth
 - (D) Lower carrier requirement
26. In frequency modulation (FM), the frequency of the carrier varies according to:
 - (A) Amplitude of the modulating signal
 - (B) Frequency of the carrier
 - (C) Phase of the modulating signal
 - (D) Bandwidth of the signal
27. The frequency spectrum of sinusoidal FM consists of:
 - (A) A single carrier frequency
 - (B) Infinite sidebands spaced at integer multiples of modulating frequency
 - (C) Only upper sidebands
 - (D) Only lower sidebands
28. Non-sinusoidal modulation typically results in:
 - (A) Constant bandwidth
 - (B) Linear phase shift
 - (C) Complex sideband structure
 - (D) No carrier component

29. Phase modulation differs from FM primarily in:
- (A) Carrier amplitude variation
 - (B) Use of envelope detection
 - (C) Modulation index definition
 - (D) Dependency on instantaneous phase
30. In PM, the phase of the carrier is varied by:
- (A) Carrier frequency
 - (B) Carrier amplitude
 - (C) Modulating signal amplitude
 - (D) Modulating signal frequency
31. A varactor diode modulator works by:
- (A) Varying capacitance with voltage
 - (B) Varying resistance with current
 - (C) Varying inductance with frequency
 - (D) Varying gain with temperature
32. Reactance modulators simulate:
- (A) Voltage-controlled oscillator
 - (B) Envelope detector
 - (C) Variable reactance using active components
 - (D) Constant impedance network
33. The Armstrong method is an example of:
- (A) Direct FM generation
 - (B) Indirect FM generation using phase modulation
 - (C) PLL-based FM synthesis
 - (D) Frequency multiplication
34. In Armstrong's method, frequency deviation is achieved by:
- (A) Varying carrier amplitude
 - (B) Using a varactor diode
 - (C) Phase shifting and frequency multiplication
 - (D) Envelope detection
35. An FM transmitter typically includes:
- (A) Envelope detector
 - (B) Mixer and IF amplifier
 - (C) Oscillator, modulator, and power amplifier
 - (D) Ratio detector
36. Foster-Seeley discriminator is used for:
- (A) AM detection
 - (B) FM detection using phase comparison
 - (C) Phase modulation
 - (D) Frequency synthesis

37. The ratio detector differs from Foster-Seeley in:
- (A) Use of envelope detection
 - (B) Improved amplitude noise rejection
 - (C) Need for limiter stage
 - (D) Use of phase comparator
38. PLL demodulator locks onto:
- (A) Amplitude variations
 - (B) Phase envelope
 - (C) Instantaneous frequency of FM signal
 - (D) Carrier amplitude
39. Automatic frequency control (AFC) is used to:
- (A) Stabilize local oscillator frequency
 - (B) Detect phase shifts
 - (C) Increase modulation index
 - (D) Enhance sideband separation
40. In PLL demodulation, the loop filter:
- (A) Amplifies carrier
 - (B) Detects envelope
 - (C) Generates sidebands
 - (D) Controls VCO to match input frequency
41. Pre-emphasis improves:
- (A) Carrier stability
 - (B) Phase linearity
 - (C) Signal-to-noise ratio for high frequencies
 - (D) Bandwidth efficiency
42. De-emphasis is applied at:
- (A) Transmitter
 - (B) Receiver
 - (C) Modulator
 - (D) Oscillator
43. The time constant of pre-emphasis in FM broadcasting is typically:
- (A) 25 ms
 - (B) 50 ms
 - (C) 75 μ s
 - (D) 100 μ s
44. FM is more resistant to noise than AM because:
- (A) It uses envelope detection
 - (B) It has lower bandwidth
 - (C) It uses phase comparison
 - (D) Noise affects amplitude, not frequency

45. One key difference between FM and PM is:
- (A) FM frequency deviation depends on amplitude
 - (B) PM frequency deviation depends on frequency
 - (C) FM uses envelope detection
 - (D) PM has constant bandwidth
46. The modulation index in FM is defined as:
- (A) Ratio of carrier to modulating frequency
 - (B) Ratio of bandwidth to carrier frequency
 - (C) Ratio of frequency deviation to modulating frequency
 - (D) Ratio of sideband power to carrier power
47. In sinusoidal FM, increasing modulation index results in:
- (A) Reduced bandwidth
 - (B) Constant sidebands
 - (C) Lower carrier power
 - (D) More significant sidebands
48. FM bandwidth is best estimated using:
- (A) Nyquist formula
 - (B) Carson's rule
 - (C) Fourier transform
 - (D) Bessel function
49. In FM, the carrier amplitude:
- (A) varies with modulation
 - (B) is suppressed
 - (C) remains constant
 - (D) is phase-shifted
50. The discriminator output in FM detection is proportional to:
- (A) Carrier amplitude
 - (B) Modulating signal phase
 - (C) Sideband amplitude
 - (D) Instantaneous frequency deviation
51. The Sampling Theorem states that a signal can be reconstructed if sampled at a rate:
- (A) Greater than twice its highest frequency
 - (B) Equal to its bandwidth
 - (C) Less than Nyquist rate
 - (D) Equal to carrier frequency
52. Band-pass signals are sampled using:
- (A) Uniform sampling at baseband
 - (B) Band-pass sampling at twice the bandwidth
 - (C) Natural sampling only
 - (D) Flat-top sampling

53. In PAM, the amplitude of pulses represents:
- (A) Carrier frequency
 - (B) Pulse width
 - (C) Instantaneous signal amplitude
 - (D) Sampling rate
54. PWM encodes information in:
- (A) Pulse amplitude
 - (B) Pulse position
 - (C) Carrier phase
 - (D) Pulse width
55. PPM is more immune to noise than PAM because:
- (A) It uses amplitude variation
 - (B) It uses width variation
 - (C) It uses time position of pulses
 - (D) It uses frequency modulation
56. Ideal sampling assumes:
- (A) Instantaneous sampling with infinite bandwidth
 - (B) Constant amplitude pulses
 - (C) Finite pulse width
 - (D) Use of holding circuits
57. Natural sampling differs from ideal sampling in that:
- (A) It uses rectangular pulses
 - (B) It requires quantization
 - (C) It retains the shape of the input signal during sampling
 - (D) It uses frequency modulation
58. Flat-top sampling introduces distortion due to:
- (A) Phase shift
 - (B) Frequency aliasing
 - (C) Pulse width variation
 - (D) Loss of high-frequency components
59. Signal recovery through holding involves:
- (A) Frequency shifting
 - (B) Maintaining sampled value until next sample
 - (C) Pulse width modulation
 - (D) Quantization
60. Channel bandwidth for PAM depends on:
- (A) Carrier frequency
 - (B) Pulse width
 - (C) Sampling rate and pulse shape
 - (D) Quantization levels

61. Quantization introduces:
- (A) Phase distortion
 - (B) Quantization noise
 - (C) Frequency aliasing
 - (D) Amplitude clipping
62. In PCM, the signal is:
- (A) Modulated in frequency
 - (B) Sampled and phase encoded
 - (C) Sampled, quantized, and digitally encoded
 - (D) Converted to analog pulses
63. Differential PCM reduces:
- (A) Carrier frequency
 - (B) Sampling rate
 - (C) Quantization error
 - (D) Bit rate by encoding signal difference
64. Delta modulation encodes:
- (A) Absolute signal value
 - (B) Change in signal amplitude
 - (C) Pulse width
 - (D) Frequency deviation
65. Adaptive Delta Modulation improves over DM by:
- (A) Using fixed step size
 - (B) Encoding absolute values
 - (C) Varying step size based on signal slope
 - (D) Using Manchester encoding
66. CVSD stands for:
- (A) Continuously Variable Slope Delta
 - (B) Carrier Variable Signal Detection
 - (C) Coded Voltage Sampling Device
 - (D) Controlled Vector Signal Demodulation
67. CVSD is primarily used in:
- (A) Radar systems
 - (B) Voice communication systems
 - (C) Satellite telemetry
 - (D) Image processing
68. Unipolar encoding uses:
- (A) Positive and negative levels
 - (B) Phase shifts
 - (C) Amplitude modulation
 - (D) Only one polarity for binary '1'

69. Polar encoding differs from unipolar by:
- (A) Using frequency variation
 - (B) Using carrier phase
 - (C) Using pulse width
 - (D) Assigning opposite polarities to binary values
70. Bipolar encoding helps reduce:
- (A) Quantization error
 - (B) Sampling rate
 - (C) DC component in transmission
 - (D) Carrier frequency
71. Manchester encoding represents binary '1' as:
- (A) High level throughout
 - (B) Low level throughout
 - (C) Transition from low to high
 - (D) No transition
72. Manchester encoding is self-clocking because:
- (A) It uses amplitude variation
 - (B) It uses frequency modulation
 - (C) It uses phase shift keying
 - (D) Each bit contains a transition
73. Line encoding affects:
- (A) Bandwidth and synchronization
 - (B) Quantization noise
 - (C) Carrier frequency
 - (D) Pulse width
74. In digital communication, quantization error can be minimized by:
- (A) Reducing sampling rate
 - (B) Using delta modulation
 - (C) Using unipolar encoding
 - (D) Increasing number of quantization levels
75. The main advantage of PCM over analog modulation is:
- (A) Lower bandwidth
 - (B) Simpler circuitry
 - (C) Better noise immunity
 - (D) Use of carrier phase
76. In Amplitude Shift Keying (ASK), the binary data is represented by:
- (A) Variations in carrier amplitude
 - (B) Changes in carrier phase
 - (C) Frequency deviation
 - (D) Pulse width

77. BPSK differs from ASK primarily in:
- (A) Use of amplitude variation
 - (B) Use of phase reversal to represent bits
 - (C) Use of multiple carriers
 - (D) Use of frequency hopping
78. Differential PSK (DPSK) avoids the need for:
- (A) Amplitude detection
 - (B) Frequency synchronization
 - (C) Carrier phase recovery
 - (D) Bandwidth expansion
79. In QPSK, each symbol represents:
- (A) One bit
 - (B) Two amplitude levels
 - (C) Two bits using four phase states
 - (D) Four frequency tones
80. M-ary QASK combines:
- (A) Frequency and time modulation
 - (B) Phase and frequency modulation
 - (C) Pulse width and amplitude modulation
 - (D) Amplitude and phase modulation
81. Quadrature Amplitude Modulation (QAM) is widely used because:
- (A) It offers high spectral efficiency
 - (B) It uses constant envelope signals
 - (C) It avoids phase ambiguity
 - (D) It requires no synchronization
82. In QAM, the constellation diagram represents:
- (A) Frequency tones
 - (B) Pulse widths
 - (C) Amplitude and phase combinations
 - (D) Bit error rates
83. Higher-order QAM schemes (e.g., 64-QAM) are more susceptible to:
- (A) Phase drift
 - (B) Noise and distortion
 - (C) Frequency offset
 - (D) Pulse jitter
84. The main challenge in implementing QAM is:
- (A) Carrier suppression
 - (B) Accurate amplitude and phase control
 - (C) Pulse shaping
 - (D) Symbol timing

85. QAM is preferred over PSK in bandwidth-limited channels because:
- (A) It uses fewer symbols
 - (B) It avoids carrier recovery
 - (C) It transmits more bits per symbol
 - (D) It uses constant envelope
86. Frequency Shift Keying (FSK) represents data by:
- (A) Amplitude levels
 - (B) Phase transitions
 - (C) Pulse widths
 - (D) Discrete frequency changes
87. Binary FSK uses:
- (A) Two distinct frequencies
 - (B) Two phase shifts
 - (C) Two amplitude levels
 - (D) Two time slots
88. FSK is more robust than ASK in noisy environments because:
- (A) It uses phase detection
 - (B) It uses amplitude variation
 - (C) It uses differential encoding
 - (D) Frequency components are less affected by noise
89. Minimum Shift Keying (MSK) is a form of:
- (A) Amplitude modulation
 - (B) Continuous phase frequency modulation
 - (C) Pulse width modulation
 - (D) Differential encoding
90. MSK minimizes bandwidth by:
- (A) Using high amplitude pulses
 - (B) Using differential encoding
 - (C) Maintaining minimum frequency separation
 - (D) Using envelope detection
91. In DPSK, the information is encoded in:
- (A) Absolute phase
 - (B) Amplitude envelope
 - (C) Frequency deviation
 - (D) Phase difference between successive symbols
92. The constellation of QPSK has:
- (A) Two points
 - (B) Four points
 - (C) Eight points
 - (D) Sixteen points

93. In M-ary modulation, increasing M leads to:
- (A) Lower data rate
 - (B) Higher spectral efficiency
 - (C) Reduced symbol complexity
 - (D) Lower bandwidth usage
94. The Bit Error Rate (BER) of BPSK in AWGN is:
- (A) Lower than ASK
 - (B) Higher than QPSK
 - (C) Equal to FSK
 - (D) Independent of SNR
95. MSK is considered a special case of:
- (A) ASK
 - (B) QAM
 - (C) DPSK
 - (D) Continuous phase FSK
96. Coherent detection requires:
- (A) Amplitude matching
 - (B) Frequency hopping
 - (C) Carrier phase synchronization
 - (D) Pulse shaping
97. Non-coherent detection is suitable for:
- (A) QAM
 - (B) BPSK
 - (C) MSK
 - (D) FSK and DPSK
98. The bandwidth of MSK is:
- (A) Twice that of BPSK
 - (B) Equal to ASK
 - (C) Lower than conventional FSK
 - (D) Independent of modulation index
99. In QASK, the number of amplitude levels increases with:
- (A) Carrier frequency
 - (B) Symbol duration
 - (C) Modulation order
 - (D) Pulse width
100. The main advantage of QPSK over BPSK is:
- (A) Simpler detection
 - (B) Higher data rate with same bandwidth
 - (C) Lower power requirement
 - (D) Reduced phase ambiguity

Rough Work / रफ कार्य

Example :

Question :

Q.1 (A) ● (C) (D)

Q.2 (A) (B) ● (D)

Q.3 (A) ● (C) (D)

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 & 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.

उदाहरण :

प्रश्न :

प्रश्न 1 (A) ● (C) (D)

प्रश्न 2 (A) (B) ● (D)

प्रश्न 3 (A) ● (C) (D)

5. प्रत्येक प्रश्न के अंक समान हैं। आपके जितने उत्तर सही होंगे, उन्हीं के अनुसार अंक प्रदान किये जायेंगे।
6. सभी उत्तर केवल ओ०एम०आर० 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. ओ०एम०आर० 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 में, रफ-कार्य के लिए दिए खाली पेज पर ही किया जाना चाहिए।
11. परीक्षा-कक्ष में लॉग-बुक, कैल्कुलेटर, 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 प्रश्नपुस्तिका के सभी पृष्ठ भलीभाँति छपे हुए हैं। यदि प्रश्नपुस्तिका में कोई कमी हो, तो कक्षनिरीक्षक को दिखाकर उसी सिरिज की दूसरी प्रश्नपुस्तिका प्राप्त कर लें।