Roll No. .....

Question Booklet Number

O. M. R. Serial No.

M. Sc. (Electronics) (Second Semester)
(NEP) EXAMINATION, 2025-26

ELECTROMAGNETIC, ANTENNA AND MICROWAVE THEORY

Paper Code						
B	1	4	0	8	0	2	T

Questions Booklet Series
A

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. Maxwell's curl equation for Faraday's law is :

(A) $\nabla.D = \rho$

(B) $\nabla \times E = -\partial B/\partial t$

(C) $\nabla \times H = J$

(D) $\nabla.B = 0$

2. In free space, intrinsic impedance η_0 is approximately :

(A) $120\pi\ \Omega$

(B) $377\pi\ \Omega$

(C) $60\pi\ \Omega$

(D) $50\ \Omega$

3. Poynting vector represents :

(A) Electric flux

(B) Magnetic flux

(C) Power density

(D) Energy density

4. For uniform plane wave in free space, E and H are :

(A) Parallel

(B) Anti-parallel

(C) Perpendicular

(D) Random

5. Wave equation is derived from :

(A) Gauss law only

(B) Maxwell's equations

(C) Ohm's law

(D) Kirchhoff's law

6. Propagation constant γ in lossless medium is :

(A) α

(B) β

(C) $\alpha + j\beta$

(D) $j\beta$

7. In perfect dielectric, conductivity σ equals :

(A) 1

(B) ∞

(C) 0

(D) ε

8. Reflection coefficient Γ equals :

(A) $(Z_1 - Z_2) / (Z_1 + Z_2)$

(B) $(Z_2 - Z_1) / (Z_2 + Z_1)$

(C) Z_1 / Z_2

(D) Z_2 / Z_1

9. Brewster angle occurs when :

(A) Reflected wave = 0

(B) Transmitted wave = 0

(C) $\Gamma = 1$

(D) $\beta = 0$

10. Duality theorem relates :

(A) E and H

(B) V and I

(C) D and B

(D) All of the above

11. Uniqueness theorem ensures :

(A) Unique field solution

(B) Infinite solutions

(C) No solution

(D) Multiple reflections

12. Image theory is useful for :

(A) Free space waves

(B) Antenna over ground plane

(C) Waveguides

(D) Radar

13. In lossy medium attenuation constant depends on :

(A) ε only

(B) μ only

(C) σ only

(D) ε, μ, σ

14. Phase velocity in free space is :

(A) 3×10^8 m/s

(B) 3×10^6 m/s

(C) 3×10^7 m/s

(D) 1×10^8 m/s

15. Poynting vector S =

(A) E × H

(B) H × E

(C) E.H

(D) E/H

16. For normal incidence, transmission coefficient depends on :

(A) Impedance only

(B) Frequency only

(C) Length only

(D) Area

17. Wave number k = :

(A) ω/μ

(B) ω/ε

(C) $\omega\sqrt{(\mu\varepsilon)}$

(D) $\sqrt{(\mu/\varepsilon)}$

18. In uniform plane wave, field variation is along :

(A) Same direction as E

(B) Same as H

(C) Direction of propagation

(D) Perpendicular to propagation

19. Perfect conductor has σ =

(A) 0

(B) ∞

(C) 1

(D) ε

20. Skin depth decreases when :

(A) Frequency increases

(B) Frequency decreases

(C) σ decreases

(D) μ decreases

21. Energy density of EM wave depends on :

(A) E only

(B) H only

(C) Both E and H

(D) None of the above

22. Boundary condition at dielectric interface keeps :

(A) Tangential E continuous

(B) Normal H continuous

(C) Tangential B zero

(D) Normal E zero

23. Intrinsic impedance η = :

(A) $\sqrt{(\mu/\varepsilon)}$

(B) $\sqrt{(\varepsilon/\mu)}$

(C) μ/ε

(D) ε/μ

24. TEM wave cannot propagate in :

(A) Free space

(B) Coaxial line

(C) Rectangular waveguide

(D) Parallel plate

25. Reciprocity theorem applies to :

(A) Linear passive networks

(B) Non-linear networks

(C) Active networks

(D) Time-varying systems

26. Characteristic impedance Z_0 =

(A) $\sqrt{(R / G)}$

(B) $\sqrt{(L / C)}$

(C) $\sqrt{(G / R)}$

(D) $\sqrt{(RC)}$

27. VSWR = 1 indicates :

(A) Full reflection

(B) Partial reflection

(C) Perfect matching

(D) Open circuit

28. Input impedance of $\lambda/4$ line is :

(A) Z_0

(B) Z_0^2 / Z_L

(C) Z_L

(D) 0

29. Smith chart is used for :

(A) Frequency measurement

(B) Impedance matching

(C) Gain calculation

(D) Polarization

30. Stub matching is used for :

(A) Amplification

(B) Impedance matching

(C) Filtering

(D) Radiation

31. Radiation resistance represents :

(A) Ohmic loss

(B) Radiated power

(C) Reflected power

(D) Stored energy

32. Directivity is ratio of :

(A) Max radiation to average radiation

(B) Power to voltage

(C) Voltage to current

(D) None of the above

33. Antenna gain includes :

(A) Directivity only

(B) Efficiency only

(C) Directivity × efficiency

(D) Power only

34. Dipole length for half-wave is :

(A) λ

(B) $\lambda/2$

(C) $\lambda/4$

(D) 2λ

35. Parabolic reflector provides :

(A) Omnidirectional pattern

(B) High directivity

(C) Low gain

(D) Circular polarization

36. Yagi antenna is :

(A) Loop

(B) Array

(C) Reflector

(D) Horn

37. Log periodic antenna has :

(A) Fixed frequency

(B) Narrow bandwidth

(C) Wide bandwidth

(D) No gain

38. Loop antenna is mainly :

(A) Electric dipole

(B) Magnetic dipole

(C) Reflector

(D) Waveguide

39. Polarization depends on :

(A) E-field orientation

(B) H-field only

(C) Frequency

(D) Gain

40. Beam width inversely proportional to :

(A) Gain

(B) Power

(C) Resistance

(D) Voltage

41. Coaxial cable supports :

(A) TE

(B) TM

(C) TEM

(D) None of the above

42. Standing wave occurs due to :

(A) Matching

(B) Reflection

(C) Radiation

(D) Absorption

43. Return loss relates to :

(A) Γ

(B) Gain

(C) Beam width

(D) Polarization

44. Directive gain unit is :

(A) Watt

(B) dB

(C) Ohm

(D) Volt

45. Folded dipole impedance is approximately :

(A) 73 Ω

(B) 300 Ω

(C) 50 Ω

(D) 600 Ω

46. Bandwidth increases with :

(A) Thin antenna

(B) Thick antenna

(C) Short antenna

(D) Small radius

47. Admittance Y =

(A) 1/Z

(B) Z

(C) R + X

(D) XL

48. Radiation pattern plotted in :

(A) Cartesian

(B) Polar

(C) Rectangular

(D) Log only

49. Horn antenna is used at :

(A) LF

(B) HF

(C) Microwave

(D) Audio

50. Lens antenna controls :

(A) Phase front

(B) Voltage

(C) Current

(D) Resistance

51. Two-element array increases :

(A) Gain

(B) Loss

(C) VSWR

(D) Resistance

52. Microstrip antenna is :

(A) Wire antenna

(B) Printed antenna

(C) Loop

(D) Parabolic

53. Radiation mechanism due to :

(A) Static charges

(B) Accelerated charges

(C) Constant current

(D) DC

54. Impedance matching minimizes :

(A) Gain

(B) Reflection

(C) Directivity

(D) Bandwidth

55. SWR formula is :

(A) $(1 + \Gamma) / (1 - \Gamma)$

(B) $(1 - \Gamma) / (1 + \Gamma)$

(C) Γ^2

(D) $1/\Gamma$

56. Infinitesimal dipole length is :

(A) λ

(B) $\lambda/2$

(C) $\lambda/4$

(D) $<< \lambda$

57. Radiation pattern of small dipole is :

(A) Omnidirectional

(B) Figure-8

(C) Circular

(D) Random

58. Near field region is also called :

(A) Fraunhofer

(B) Fresnel

(C) Reactive

(D) Far zone

59. Far field pattern independent of :

(A) Distance

(B) Angle

(C) Frequency

(D) Current

60. Half-wave dipole directivity is approximately :

(A) 1

(B) 1.64

(C) 2

(D) 10

61. Ground effect modifies :

(A) Pattern

(B) Frequency

(C) Voltage

(D) Current

62. N-element array spacing affects :

(A) Pattern

(B) Voltage

(C) Resistance

(D) None of the above

63. Uniform amplitude array has :

(A) Equal currents

(B) Different currents

(C) No current

(D) Infinite current

64. Array factor depends on :

(A) Geometry

(B) Frequency

(C) Phase

(D) All of the above

65. Broadside array main beam :

(A) Along axis

(B) Perpendicular axis

(C) Random

(D) None of the above

66. End-fire array main beam :

(A) Along axis

(B) Perpendicular

(C) Circular

(D) None of the above

67. Circular array produces :

(A) Linear pattern

(B) Circular symmetry

(C) No pattern

(D) DC

68. Increasing N increases :

(A) Beamwidth

(B) Directivity

(C) Loss

(D) VSWR

69. Region separation is based on :

(A) Distance

(B) Frequency

(C) Power

(D) Gain

70. Finite dipole is longer than :

(A) λ

(B) $\lambda/2$

(C) $\lambda/10$

(D) 2λ

71. Radiation resistance of small dipole is :

(A) High

(B) Low

(C) Infinite

(D) Zero

72. Array factor is independent of :

(A) Element type

(B) Spacing

(C) Phase

(D) Number

73. Two-element spacing $\lambda/2$ avoids :

(A) Grating lobes

(B) Main lobe

(C) Reflection

(D) Loss

74. Pattern multiplication =

(A) Element × array factor

(B) Sum

(C) Difference

(D) Division

75. Near field stores :

(A) Radiated power

(B) Reactive energy

(C) Heat

(D) Noise

76. Dominant mode in rectangular waveguide is :

(A) TE10

(B) TE01

(C) TM11

(D) TEM

77. Cutoff frequency depends on :

(A) Dimensions

(B) Power

(C) Voltage

(D) Current

78. TEM mode is not possible in :

(A) Coaxial

(B) Waveguide

(C) Parallel plate

(D) Two-wire

79. Waveguide acts as a/an :

(A) High-pass filter

(B) Low-pass filter

(C) Band-stop filter

(D) Amplifier

80. Phase velocity in waveguide is :

(A) $< c$

(B) $= c$

(C) $> c$

(D) 0

81. Group velocity × phase velocity =

(A) c

(B) c^2

(C) 1

(D) 0

82. Cavity resonator is used for :

(A) Storage

(B) Oscillation

(C) Amplification

(D) Matching

83. Q-factor measures :

(A) Loss

(B) Selectivity

(C) Power

(D) Voltage

84. H-plane tee divides :

(A) E-field

(B) H-field

(C) Power equally

(D) None of the above

85. Magic tee is a combination of :

(A) E and H tee

(B) Two H

(C) Two E

(D) None of the above

86. S-parameters are used at :

(A) Low frequency

(B) Microwave

(C) Audio

(D) DC

87. Circulator is :

(A) Reciprocal

(B) Non-reciprocal

(C) Passive reciprocal

(D) None of the above

88. Isolator allows :

(A) Two-way

(B) One-way

(C) No-way

(D) Infinite

89. Directional coupler measures :

(A) Frequency

(B) Power

(C) Voltage

(D) Resistance

90. RADAR stands for :

(A) Radio Detection and Ranging

(B) Random Detection

(C) Radio Data

(D) None of the above

91. RADAR range depends on :

(A) Frequency

(B) Power

(C) RCS

(D) All of the above

92. Pulse radar measures :

(A) Velocity

(B) Range

(C) Current

(D) Voltage

93. Doppler radar measures :

(A) Range

(B) Velocity

(C) Angle

(D) Power

94. Scattering matrix relates :

(A) Voltages

(B) Incident and reflected waves

(C) Power only

(D) Current

95. Rectangular waveguide TE mode has :

(A) $E_z \neq 0$

(B) $H_z = 0$

(C) $E_z = 0$

(D) Both zero

96. Circular waveguide dominant mode is :

(A) TE11

(B) TM01

(C) TEM

(D) TE10

97. Hybrid Tee has :

(A) 3 ports

(B) 4 ports

(C) 2 ports

(D) 5 ports

98. Cutoff wavelength λ_c relation is :

(A) $\lambda > \lambda_c$ propagate

(B) $\lambda < \lambda_c$ propagate

(C) Equal only

(D) None of the above

99. Wave impedance in TE mode varies with :

(A) Frequency

(B) Voltage

(C) Power

(D) Current

100. RADAR cross section measures :

(A) Target reflectivity

(B) Gain

(C) Bandwidth

(D) Noise

(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।