QP Series Code : **BC**

অসম দক্ষতা বিশ্ববিদ্যালয়

ASSAM SKILL UNIVERSITY
(A Govt of Assam University)

Assam Skill University Entrance Examinations 2026

M.TECH IN ELECTRONICS AND COMMUNICATION ENGINEERING

(Paper No. : 10)

Full Marks : 100 Time : 130 minutes

Total number of pages in this booklet : 12

DO NOT OPEN THE QUESTION BOOKLET UNTIL YOU ARE INSTRUCTED

All candidates are required to read the instructions given below, before starting to write the answers. Ensure to write your ROLL NUMBER AT THE BOTTOM OF THIS PAGE.

Instructions

1. Candidate should keep his/her admit card on the table with his/her latest photograph pasted on it.
2. There are 75 MCQs meant for applicants **for admission in M.Tech. in Electronics and Communication Engineering**. All questions are compulsory. MCQs are as per the given syllabus.
3. Each **MCQ carries 1 mark for Question No 1 to 50**. **Next 25 MCQs (Q.No 51 to 75) carry 2 marks for each** MCQ. (Total marks: (1 X 50=50) + (2 X 25 = 50) = 100). **Full marks : 100**.
4. The answers are to be given by making proper marking on the **OMR with ball point Black pen** only.
5. No loose sheet is allowed. Rough work, if required, may be done on the blank pages at the end of this question paper.
6. Talking with any other candidate inside the examination hall may lead to disqualification of the candidate.
7. **OMRs must be signed by the candidate and the invigilator**. **The candidate has to ensure the same, because lack of these signatures will lead to cancellation of the OMR.**
8. Candidate has to put his/her signature on the attendance sheet. **No candidate is allowed to leave the examination hall before completion of 1 (one) hour from the commencement of examination.**
9. Candidate needs to check the Question booklet after instructed by the invigilator and report if any discrepancies are noticed in the booklet regarding number of pages or damaged pages.
10. **Marking in more than one option against any question on the OMR will cancel that answer**. Instructions are given on the reverse of the OMRs.
11. **Correct Roll Code is to be written on the concerned OMR**.
12. Handover the Question Paper and the OMR sheet to the invigilator before leaving the exam hall.

Roll Code : | M | E | C | Roll Number : | | | | | | | |

Sl. No. of the OMR : | | | | | | | | Signature of the candidate:.....

MTech in Electronics and Communication Engineering

SECTION–I

Choose the appropriate option for the following questions : 1×40=40

1. If a 3×4 matrix has rank 3, what is the dimension of its null space?

(A) 0 (B) 1

(C) 2 (D) 3

2. For the system of linear equations $Ax = b$, if rank(A) = rank([A | b]) < number of variables, then the system has:

(A) No solution (B) Unique solution

(C) Infinitely many solutions (D) Exactly two solutions

3. The eigenvalues of a real symmetric matrix are always:

(A) Complex (B) Real

(C) Zero (D) Negative

4. If *X* and *Y* are independent events, then $P(X \cap Y)$ =:

(A) *P(X) + P(Y)* (B) *P(X) · P(Y)*

(C) *P(X) – P(Y)* (D) 0

5. The residue of $f(z) = \frac{1}{z}$ at z = 0 is :

(A) 0 (B) 1

(C) ∞ (D) –1

6. A function $f(z)$ is analytic at a point if :

(A) It is continuous there

(B) Its real part is continuous

(C) It is differentiable in a neighborhood of that point

(D) It has a Taylor series at that point only

7. If $\vec{F} = x\hat{i} + y\hat{j} + z\hat{k}$, then $\nabla . \vec{F}$ is :

(A) 0 (B) 1

(C) 3 *(D)* $x + y + z$

8. The method of variation of parameters is used to find:

(A) Complementary function

(B) Particular integral

(C) General solution of homogeneous equation

(D) Eigenvalues

9. The general solution of $\frac{dy}{dx} + xy = 0$ is :

(A) $y = Ce^{-x^2/2}$ (B) $y = Ce^{x^2/2}$

(C) $y = Cx$ (D) $y = Ce^{-x}$

10. What is the real and imaginary part of $\left(1 - j\sqrt{3}\right)^{12}$

(A) Real part is $e^{-\frac{\pi}{2}}$ and imaginary part is 1.

(B) Real part is $e^{-\frac{\pi}{4}}$ and imaginary part is 1.

(C) Real part is $e^{-\frac{\pi}{2}}$ and imaginary part is 0.

(D) Real part is 0 and imaginary part is $e^{-\frac{\pi}{2}}$.

11. Ohm's law is valid for

(A) Nonlinear devices (B) Bilateral linear circuits

(C) Unilateral devices (D) Semiconductor junctions only

12. The power factor of a purely resistive circuit is

(A) 0 (B) 0.5

(C) 1 (D) Infinity

13. Kirchhoff's Current Law is based on conservation of

(A) Energy (B) Charge

(C) Momentum (D) Power

14. The reactance of an inductor increases with

(A) Increase in frequency (B) Decrease in frequency

(C) Increase in resistance (D) Decrease in inductance

15. The time constant of an RC circuit is

(A) R/C (B) RC

(C) L/R (D) 1/RC

16. In a series RLC circuit at resonance, the impedance is

(A) Maximum (B) Minimum

(C) Zero (D) Infinite

17. The phase difference between voltage and current in a pure capacitor is

(A) 0° (B) 45°

(C) 90° (D) 180°

18. The reciprocal of resistance is called

(A) Impedance (B) Conductance

(C) Reactance (D) Susceptance

19. The RMS value of a sine wave is equal to

(A) Peak value (B) Peak/2

(C) Peak/$\sqrt{2}$ (D) 2 × Peak

20. Thevenin's theorem is applicable to

(A) Linear circuits (B) Nonlinear circuits

(C) Digital circuits (D) Magnetic circuits

21. In nodal analysis, KCL is applied at

(A) Loops (B) Branches

(C) Nodes (D) Meshes

22. An ideal voltage source has

(A) Infinite resistance (B) Zero resistance

(C) Unit resistance (D) Variable resistance

23. The quality factor of a resonant circuit indicates

(A) Power loss (B) Selectivity

(C) Frequency drift (D) Voltage gain only

24. Superposition theorem is valid only for

(A) Linear circuits (B) Nonlinear circuits

(C) Active circuits only (D) Passive circuits only

25. Int Net =0; If x<50 if (y>5) Net=x+y; else Net=x–y; For this C program segment, x=55, and y=5, then the value Net is

(A) 50 (B) 0

(C) 60 (D) 55

26. The dual of current source is

(A) Voltage source (B) Capacitor

(C) Resistor (D) Inductor

27. Maximum power transfer occurs when load resistance equals

(A) Source resistance (B) Zero

(C) Infinity (D) Half of source resistance

28. The Laplace transform converts differential equations into

(A) Integral equations (B) Algebraic equations

(C) Matrix equations (D) Nonlinear equations

29. A passive element can

(A) Generate energy (B) Store energy

(C) Amplify signals (D) Oscillate independently

30. In a purely inductive AC circuit, current

(A) Leads voltage by 90° (B) Lags voltage by 90°

(C) Is in phase (D) Leads by 45°

31. The bandwidth of a resonant circuit is inversely proportional to

(A) Resistance (B) Quality factor

(C) Inductance (D) Capacitance

32. The condition for resonance in RLC circuit is

(A) $X_L > X_C$ (B) $X_L < X_C$

(C) $X_L = X_C$ (D) $R = X_L$

33. Which parameter remains constant in parallel resonance?

(A) Current (B) Voltage

(C) Frequency (D) Impedance

34. The natural response of a circuit depends on

(A) External source (B) Initial conditions

(C) Frequency only (D) Power factor

35. The breakdown mechanism in heavily doped diodes is

(A) Avalanche breakdown (B) Zener breakdown

(C) Thermal breakdown (D) Surface breakdown

36. An ideal op-amp has infinite

(A) Output resistance (B) Gain

(C) Input current (D) Offset voltage

37. The output of a half-wave rectifier contains

(A) Pure DC (B) Pure AC

(C) Pulsating DC (D) Not output

38. In CE configuration, the output is

(A) In phase (B) 180° out of phase

(C) 90° out of phase (D) Independent of input

39. The emitter follower circuit has

(A) High voltage gain (B) Unity voltage gain

(C) Zero gain (D) Infinite gain

40. Which amplifier class has highest efficiency ?

(A) Class A (B) Class B

(C) Class AB (D) Class C

41. A flip-flop stores

(A) 8 bits (B) 4 bits

(C) 2 bits (D) 1 bit

42. The Boolean expression $A+\overline{A}$ equals

(A) 0 (B) 1

(C) A (D) $\overline{A}$

43. Gray code is useful because

(A) It reduces hardware

(B) Adjacent numbers differ by one bit

(C) It uses fewer bits

(D) It increases speed

44. Which flip-flop has no invalid state?

(A) SR (B) JK

(C) D (D) T

45. In Karnaugh map, simplification is done to

(A) Increase logic gates (B) Reduce Boolean expression

(C) Increase delay (D) Improve voltage

46. The stack in microprocessor works on

(A) FIFO (B) LIFO

(C) Random access (D) Parallel access

47. Which memory is fastest?

(A) RAM (B) ROM

(C) Cache (D) Hard disk

48. 8051 microcontroller has

(A) No ROM (B) On-chip ROM

(C) No RAM (D) No I/O ports

49. Moore's law relates to

(A) Power dissipation (B) Transistor density

(C) Voltage gain (D) Signal bandwidth

50. Scaling in VLSI aims to

(A) Increase chip size (B) Reduce transistor dimensions

(C) Increase power consumption (D) Reduce speed

SECTION–II

Answer the following questions by selecting the correct option : (Each question carries 2 marks Q. No. 51 to 75). 2×25=50

51. For the Z-transform $X(Z) = 4Z^2 + 2 + 3Z^{-1}$, with ROC: $0 < |Z| < \infty$, the $x(n)$ is given by

(A) $x(n) = 4\delta[n-2] + 2\delta[n] + 3\delta[n+1]$ (B) $x(n) = 4\delta[n+2] + 2\delta[n] + 3\delta[n-1]$

(C) $x(n) = 4\delta[n+2] + 2\delta[n] + 3\delta[n+1]$ (D) $x(n) = 4\delta[n-2] + 2\delta[n-1] + 3$

52. The first non zero value of a finite-length sequence $x[n]$ occurs at index $n = -6$ and has a value $x[-6] = 3$, and the last non zero value occurs at index $n = 24$ and has a value $x[24] = -4$. What is the index of first and Last non zero values in the convolution $y[n] = x[n]*x[n]$ and what are its values ?

(A) The first non zero value is at index $n = 12$ and the value is $y[12] = 9$ and last non zero value is at index $n = 48$ and the value is $y[48] = 16$

(B) The first non zero value is at index $n = -12$ and the value is $y[-12] = 9$ and last non zero value is at index $n = 36$ and the value is $y[36] = 4$

(C) The first non zero value is at index $n = -12$ and the value is $y[-12] = 9$ and last non zero value is at index $n = 48$ and the value is $y[48] = 16$

(D) The first non zero value is at index $n = -6$ and the value is $y[-6] = 9$ and last non zero value is at index $n = 24$ and the value is $y[24] = 16$

53. What is the speed improvement factor in calculating 64 – point DFT of a sequence using direct computation and FFT algorithm

(A) 40.33 (B) 30.33

(C) 10.33 (D) 21.33

54. The result of the circular convolution of the sequences $x[n] = \{1, 5, 3, 4, -3\}$ and $h[n] = \{-3, 2, 1\}$ is

(A) $\{-13, -10, 0, -11, 14\}$ (B) $\{13, -10, 0, -11, 14\}$

(C) $\{-10, -13, 0, -11, 14\}$ (D) $\{-11, -10, 0, 13, -14\}$

55. A speech signal has a total duration of 10 Sec. It is sampled at the rate of 8 *KHz* and then encoded. The SQNR is required to be 40 *dB*. Calculate the minimum storage capacity needed to accommodate this digitized speech signal.

(A) 650 KBits (B) 560 KBits

(C) 56 MBits (D) 560 MBits

56. If a carrier modulated by a digital bit stream had one of the possible phases of 0, 90, 180 and 270 degrees then modulation is called:

(A) BPSK (B) QPSK

(C) FSK (D) MSK

57. When a plane wave propagating through free space, the direction of the field

(i) 'E' is perpendicular to the direction of propagation.

(ii) 'H' is perpendicular to the direction of propagation.

(iii) 'E' is perpendicular to the direction of the field 'H'.

(A) *(i)* and *(ii)* (B) *(ii)* and *(iii)*

(C) *(i)*, *(ii)* and *(iii)* (D) *(i)* and *(iii)*

58. For a transmission line which is terminated in a normalized impedance Zn, VSWR = 2, the value of normalized impedance is given by:

(A) 2 (B) ½

(C) 3 (D) 1/3

59. The Hamming code for 0110 using even parity is

(A) 1100110 (B) 1011011

(C) 0111011 (D) 1100101

60. A signal varies from 20 *Hz* to 5 *KHz* is passed using pulse modulation scheme. Minimum sampling rate and number of channels that could be accommodated using TDM (assume each sample takes 10 μs) respectively will be

(A) 5 *KHz*, 5 (B) 10 *KHz*, 5

(C) 10 *KHz*, 10 (D) 5 *KHz*, 10

61. The attenuation of a single mode fibers is 0.2 *dB*/*km*, at a transmission length of 100 *kms*. The output signal strength is reduced to

(A) 10% of transmitted power (B) 1% of transmitter power

(C) 5% of the transmitted power (D) 20% of the transmitted power

62. An air-filled rectangular waveguide has dimensions 6 *cm* × 4 *cm*. The cut off frequency for TE_{10} is

(A) 2.5 *GHz* (B) 25 *MHz*

(C) 20.5 *GHz* (D) 5 *GHz*

63. A sinusoidal modulating signal of amplitude A_m uses all the representation levels provided for quantization in the case of full load condition. The SNR in *dB* assuming the quantization levels to be 512 is

(A) 55.8 *dB* (B) 558 *dB*

(C) 5.88 *dB* (D) 0.58 *dB*

64. Calculate the Nyquist rate for sampling a continuous time signal which is given by $x(t)=5\cos 100\pi t+10\cos 200\pi t-15\cos 300\pi t$

(A) 300 *Hz* (B) 600 *Hz*

(C) 150 *Hz* (D) 200 *Hz*

65. Find the Nyquist sampling rate for the signal $x(t) = sinc(200t)sinc^2(1000t)$

(A) 2200 samples/sec (B) 200 samples/sec

(C) 220 samples/sec (D) 4400 samples/sec

66. A broadcast TV channel has a bandwidth of 6 *MHz*. Ignoring noise, calculate the maximum data rate that could be carried in a TV channel using a 16 level code and determine the minimum possible signal-to-noise ratio in *dB* for the calculated data rate.

(A) 24 Mbps, 48 *dB* (B) 48 Mbps, 24 *dB*

(C) 24 Mbps, 24 *dB* (D) 48 Mbps, 48 *dB*

67. 12 voice channels are sampled at 8000 sampling rate and encoded into 8 bit PCM word. Determine the rate of the data stream.

(A) 768 KBps (B) 12 KBps

(C) 12.8 KBps (D) 46.08 KBps

68. A signal contains component at 400 *Hz* and 2400 *Hz*. This signal modulates a carrier frequency 100 *MHz*. However, after demodulation it is found that the 400 *Hz* signal component is present. The channel Bandwidth is 15 *KHz*. What is the reason for the higher frequency signal not to be detected properly?

(A) Modulation used is FM and Bandwidth is insufficient.

(B) Modulation used is AM and Bandwidth is insufficient.

(C) Modulation used is FM but pre-emphasis is not used.

(D) Modulation used is AM but detector is for FM.

69. The refractive index profiles shown in figure below refers to the following optical fibers respectively:

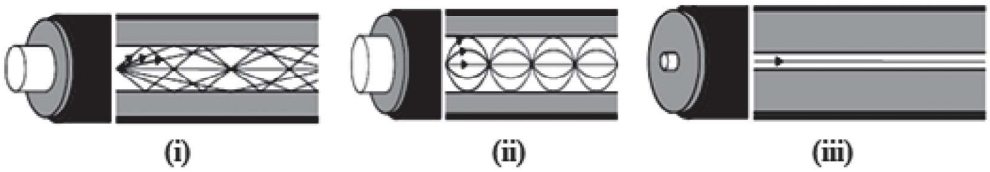
(A) Step Index, multi-mode, Single mode

(B) All are Single mode fibers

(C) Graded Index, Single mode, Step index

(D) Step index, Graded Index, Single mode

70. The type of optical fibers shown in the following Figure respectively are:



Figure

(A) Step Index, Graded Index, Single mode

(B) Graded Index, Step index, Single mode

(C) Graded Index, Single mode, Step index

(D) Step index, Graded Index, Single mode

71. An oscillator for an AM transmitter has a 100μH coil and a 10nF capacitor. If a modulating frequency of 10 *KHz* modulates the oscillator, find the frequency range of the side bands.

(A) 149 *KHz* to 169 *KHz*

(B) 184 *KHz* to 296 *KHz*

(C) 238 *KHz* to 296 *KHz*

(D) 155 *KHz* to 166 *KHz*

72. For a binary phase shift keying (BPSK) modulation with a carrier frequency of 80 *MHz* and an input bit rate of 10 MBps. Determine the minimum Nyquist bandwidth.

(A) 10 *MHz*

(B) 40 *MHz*

(C) 20 *MHz*

(D) 5 *MHz*

73. If the transmission rate of a digital communication system of 10*MBps* modulation scheme used in 16-QAM, determine the bandwidth efficiency.

(A) 2 bits/cycle

(B) 4 bits/cycle

(C) 8 bits/cycle

(D) 16 bits/cycle

74. A sinusoidal modulating signal of amplitude Am uses all the representation levels provided for quantization in the case of full load condition. The SNR in dB assuming the quantization levels to be 512 is

(A) 5.58 *dB*

(B) 0.58 *dB*

(C) 55.8 *dB*

(D) 5.88 *dB*

75. Determine the electric field intensity at a distance of 10*km* from an antenna having directive gain of 5*dB* and radiating total power of 20*kW*.

(A) 0.1732 *V/m*

(B) 0.346 *V/m*

(C) 0.195 *V/m*

(D) 0.398 *V/m*

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SPACE FOR ROUGH WORK (IF REQUIRED)