

SI-2024

Booklet No.

306863

WRITTEN TEST

For Selection to the Post of
Senior Instructor in ETC Engineering
Under Higher Education (Technical) Department,
Government of Assam

Time : 9:30 AM to 12:00 Noon

QUESTION BOOKLET

Series Code

C

INSTRUCTIONS

1. Answer the Questions in the **OMR Answer Sheet** Provided.
2. **Do not Fold/staple the OMR Answer Sheet.**
3. Open the Booklet after the Bell rings at **9:30 AM**
4. **Write and darken your Roll Number** carefully in the OMR Sheet Side-1.
5. **Darken the Correct Answer/most suitable Answer in the OMR Answer Sheet using BLACK BALL PEN.**
6. Please darken the correct option as shown below :
Correct : ● ○ ○ ○ Incorrect : ⊗ ⊘ ⊙ ⊖
7. **Write and darken your Question Booklet Series Code [A/B/C/D]** carefully in the OMR Answer Sheet.
8. There are altogether **75 Questions** and **24 pages** in the Question Booklet.
9. All Questions are Multiple Choice type Questions (MCQ).
10. **Please check the total number of Questions and Page Numbers of the Question Booklet. In case of discrepancy in this regard, please inform the Invigilator for replacement of the Question Booklet.**
11. **One (1) Mark will be awarded for every Correct Answer and for every Wrong Answer, one-fourth (0.25) mark will be deducted.**
12. No candidate will be allowed to leave the Examination Hall temporarily during the Examinations.
13. No candidate can leave the designated seat of the Examination Hall till the end of the examination.
14. **Candidates need to maintain discipline before, during and after the examination.**
15. **Use of Calculators, Cell Phones (mobiles) and other Electronic Gadgets, cameras are strictly prohibited inside the Examination Hall.**
16. The blank spaces and blank sheets attached at the end of the Question Booklet are to be used for rough calculations only.
17. You will be asked by the Invigilator to put your signature and your Left Hand Thumb Impression on the Attendance Sheet & OMR Answer Sheet. Please sign the Attendance Sheet and OMR Answer Sheet in the same way as you signed and uploaded during Online Application which is appearing in your Admit Card.
18. Please submit the OMR Answer Sheet to the Invigilator before leaving the examination hall.
19. Candidature of any candidate will be cancelled if he/she does not follow the guidelines and instructions and if he/she is found to adopt unfair means, in any form as noted by the invigilator/authority.

(TURN THIS PAGE WHEN THE BELL RINGS AT 9:30 AM)

05/SI – ETC Engineering

SEAL

**SENIOR INSTRUCTOR
ETC ENGINEERING**

1. A regulated power supply contains
- ☒ (A) Varactor diode (B) PIN diode
☒ (C) Zener diode (D) Tunnel diode
2. The _____ filter circuit results in the best voltage regulation.
- ☒ (A) choke input
(B) capacitor input
(C) resistance input
☒ (D) capacitor and resistance both
3. When a transistor amplifier is operating, the current in any branch is
- ☒ (A) sum of a.c and d.c (B) a.c only
(C) d.c. only (D) no a.c and d.c
4. The input capacitor in an amplifier is the _____ capacitor.
- ☒ (A) coupling (B) bypass
(C) leakage (D) no bypass or coupling
5. The point of intersection of d.c and a.c load lines is called
- ☒ (A) saturation point (B) cut-off point
☒ (C) operating point (D) saturation and cut-off both

6. Electrical size of antenna is increased by which of the following?
- ✓ (A) Antenna Array (B) Decreasing the coverage area
- (C) Increasing the coverage area (D) Using a single antenna
7. For long distance communication, which of the property is mainly necessary for the antenna?
- ✓ (A) High directivity (B) Low directivity
- (C) Low gain (D) Broad beam width
8. What is the progressive phase shift of the end-fire array?
- (A) 0 (B) 90
- (C) 180 (D) 60
9. Which of the following statement about antenna array is false?
- (A) Field pattern is the product of individual elements in array
- (B) Field pattern is the sum of individual elements in array
- (C) Resultant field is the vector superposition of the fields from individual elements in array
- (D) High directivity can be achieved for long distance communications
10. Which of the following is a type of microprocessor?
- (A) CISC (B) RISC
- (C) EPIC ✓ (D) All of the mentioned

11. Ohm's law for magnetic circuits is

☒ (A) $F = \phi S$

☐ (B) $F = \phi / S$

☐ (C) $F = \phi 2S$

☐ (D) $F = \phi / S^2$

12. The frequency response of transformer coupling is

☐ (A) Good

☐ (B) Very Good

☐ (C) Excellent

☐ (D) Poor

13. Which of the following are true about a tunnel diode?

1. it uses negative conductance property

2. it operates at high frequency

3. fermilevel of p side becomes higher than the n side in forward bias

☐ (A) 1 only

☐ (B) 1 and 2

☐ (C) 3 only

☐ (D) 2 and 3

14. The depletion layer of tunnel diode is very small because

☐ (A) its abrupt and has high dopants

☐ (B) uses positive conductance property

☐ (C) it's used for high frequency ranges

☒ (D) tunneling effect

15. What is pinch off voltage?

- ☐ (A) The minimum voltage required to turn on the FET
- ☒ (B) The maximum voltage a FET can withstand
- ☐ (C) Current amplification factor/voltage gain
- ☐ (D) The value of voltage at which the current gets pinched to zero

16. What will happen if gate voltage applied is positive to pinch off Voltage?

- ☒ (A) Device burns
- ☐ (B) More current flows
- ☐ (C) Nothing happens
- ☐ (D) Current remains the same

17. Varactor diode is a semiconductor diode in which the _____ can be varied as a function of reverse voltage of the diode.

- ☐ (A) Junction resistance
- ☐ (B) Junction capacitance
- ☒ (C) Junction impedance
- ☐ (D) None of the mentioned

18. _____ has more sophisticated structure than p-i-n photodiode.

- ☒ (A) Avalanche photodiode
- ☐ (B) p-n junction diode
- ☐ (C) Zener diode
- ☒ (D) Varactor diode

19. With zero volts on both inputs, an OP-amp ideally should have an output

☐ (A) 1 V

☐ (B) 100 V

☒ (C) 0 V

☐ (D) 10 V

20. A differential amplifier

☒ (A) is part of an OP-amp

☐ (B) has one input and one output

☐ (C) has only one input

☐ (D) has only one output

21. CMRR of an ideal OP-amp is

☐ (A) zero

☒ (B) infinite

☐ (C) between hundred and infinity

☐ (D) one

$$\begin{aligned} \text{CMRR} &= \frac{A_v}{A_{cm}} \\ &= \frac{\infty}{0} \\ &= \infty \end{aligned}$$

22. The voltage follower is also known as

☐ (A) an inverter

☒ (B) a buffer

☐ (C) an oscillator

☐ (D) a voltage regulator

23. The gain of a voltage follower circuit is

☒ (A) 1

☐ (B) 10

☐ (C) infinite

☐ (D) 100

24. In a frequency-modulated signal, the power _____ as the modulation index.
- (A) remains constant ~~(B) increase~~
(C) decrease (D) 0
25. Pre-emphasis circuit is
- (A) before detection (B) after detection
(C) before encoding (D) after encoding
26. Which of the following is not a form of pulse modulation?
- (A) pulse amplitude modulation
(B) pulse width modulation
(C) pulse position modulation
(D) pulse frequency modulation
27. The unit of average mutual information is
- (A) bits (B) bytes
(C) bits per symbol (D) bytes per symbol
28. _____ is a transmission method used in MIMO wireless communications to transmit encoded data signals independently.
- (A) MU-MIMO (B) STTD
(C) SM (D) Collaborative Uplink MIMO

29. In which of the following library, the package STANDARD defined?

☐ (A) IEEE

☐ (B) STD

☐ (C) WORK

☐ (D) STD_LOGIC

30. Which of the following is not defined in the STANDARD package?

☐ (A) Basic data types

☐ (B) Functions for different operations for data types

☐ (C) Functions to read from the text files

☐ (D) Functions for arithmetic operators

31. As $X_L = X_C$ in a series resonance circuit, the impedance is

☐ (A) purely capacitive

☐ (B) purely inductive

☒ (C) purely resistive

☐ (D) capacitive and inductive

32. What are filters created by using resistors and capacitors or inductors and capacitors called?

☐ (A) Active filters

☒ (B) Passive filters

☐ (C) Continuous filters

☐ (D) Differential filters

33. Find the output voltage of an ideal op-amp. If V_1 and V_2 are the two input voltages

☒ (A) $V_O = V_1 - V_2$

☒ (B) $V_O = A \times (V_1 - V_2)$
 $A=1$

☐ (C) $V_O = A \times (V_1 + V_2)$

☐ (D) $V_O = V_1 \times V_2$

34. In a horn antenna, with increase in aperture, the directivity is _____ and diffraction is _____.

- (A) increased, decreased
- (B) decreased, increased
- (C) increased, increased
- (D) decreased, decreased

35. The stored image can be displayed

- (A) for a limited time
- ✓ (B) for infinite time
- (C) for zero time
- (D) for an intermediate time

36. The analog signal is digitized using

- (A) D/A converter
- (B) Oscillator
- ✓ (C) A/D converter
- (D) Rectifier

37. Laplace transform of $\cos(at)u(t)$ is?

- ✓ (A) $s / (a^2 + s^2)$
- (B) $a / (a^2 + s^2)$
- (C) $s^2 / (a^2 + s^2)$
- ✓ (D) $a^2 / (a^2 + s^2)$

38. The maximum efficiency of a full wave rectifier is
- ☐ (A) 40.6% ☒ (B) 81.2%
- ☐ (C) 50% ☐ (D) 25%
39. The phase difference between the input and output voltage of a transistor connected in common base is
- ☐ (A) 180 degree ☐ (B) 90 degree
- ☐ (C) 270 degree ☒ (D) 0 degree
40. As the temperature of a transistor goes up, the base-emitter resistance
- ☐ (A) decrease ☒ (B) increase
- ☐ (C) remains the same ☐ (D) zero
41. The collector-base junction in a transistor has
- ☐ (A) forward bias at all times ☐ (B) reverse bias at all times
- ☒ (C) low resistance ☐ (D) high resistance
42. At cut-off, the JFET channel is
- ☐ (A) at its widest point
- ☐ (B) completely closed by the depletion region
- ☒ (C) extremely narrow
- ☐ (D) reversed biased

43. Emitter follower is a _____ circuit.

☐ (A) voltage feedback

☒ (B) current feedback

☐ (C) both (A) & (B)

☐ (D) differentiator

44. The NOR gate and OR gate followed by

☐ (A) NAND gate

☐ (B) NOR gate

☒ (C) NOT gate

☐ (D) NAND and NOR gate

45. At room temperature, an intrinsic semiconductor has

☐ (A) many holes only

☒ (B) a few free electrons and holes

☐ (C) many free electrons only

☒ (D) no holes and free electrons

46. In a receiver, distortion can occur in

☐ (A) mixer

☐ (B) detector

☐ (C) IF amplifier

☒ (D) Either mixer or detector or IF amplifier

47. Which one of the following noises becomes of great importance at high frequencies?

☐ (A) flicker noise

☐ (B) shot noise

☐ (C) impulse noise

☒ (D) Transit -time noise

48. Which of the following range represents frequency range of rainbow colors?

☐ (A) Below 4×10^{14} Hz

☒ (B) Between 4×10^{14} Hz and 8×10^{14} Hz

☐ (C) Above 8×10^{14} Hz

☐ (D) Between 0 Hz and 8×10^{14} Hz

49. The current in the R-L circuit at a time $t = 0+$ is?

☒ (A) V/R

☐ (B) R/V

☐ (C) V

☐ (D) R

50. In an R-C circuit, when the switch is closed, the response

☐ (A) do not vary with time

☒ (B) decays with time

☐ (C) rises with time

☐ (D) first increases and then decreases

51. What happens to the MMF when the magnetic flux decreases?

☐ (A) Increases

☒ (B) Decreases $\downarrow \Phi = \frac{MMF}{\mu R}$

☐ (C) Remains constant

☐ (D) Becomes zero

52. Which of the following package need not to be a part of the VHDL code?

☒ (A) STANDARD

☐ (B) STD_LOGIC_1164

☐ (C) TEXTIO

☐ (D) STD_LOGIC_ARITH

53. Space diversity is also known as

- ☐ (A) Frequency diversity
- ☒ (B) Antenna diversity
- ☐ (C) Polarization diversity
- ☐ (D) Time diversity

54. MIMO was initially developed in the year

- ☐ (A) 1970
- ☒ (B) 1990
- ☐ (C) 1960
- ☒ (D) 1985

55. Which of the following antenna is mainly used for broadband signals?

- ☐ (A) Marconi antenna
- ☒ (B) Horn antenna
- ☐ (C) Wire antenna
- ☐ (D) Yagi-Uda antenna

56. In which of the following bands the horn antenna operates?

- ☐ (A) HF and VHF
- ☐ (B) UHF and LF
- ☒ (C) UHF and SHF
- ☐ (D) LF and VHF

57. In an intrinsic semiconductor, the number of free electrons
- ☒ (A) equals the number of holes ☐ (B) is greater than number of holes
- ☐ (C) is less than the number of holes ☐ (D) zero
58. The binary number 10101 is equivalent to decimal number
- ☐ (A) 19 ☐ (B) 12
- ☐ (C) 27 ☒ (D) 21
59. At absolute temperature, an intrinsic semiconductor has
- ☐ (A) a few free electrons ☐ (B) many holes
- ☐ (C) many free electrons ☒ (D) no holes or free electrons
60. The barrier voltage at a pn junction for germanium is about
- ☐ (A) 3.5 V ☐ (B) 3 V
- ☐ (C) 0 V ☒ (D) 0.3 V
61. The maximum efficiency of a half wave rectifier is
- ☒ (A) 40.6% ☐ (B) 81.2%
- ☐ (C) 50% ☐ (D) 25%

62. The purpose of RC or transformer coupling is to
- ☐ (A) block a.c
 - ☒ (B) separate bias of one stage from another
 - ☐ (C) increase thermal stability
 - ☒ (D) block d.c
63. In the initial stages of a multistage amplifier, we use
- ☒ (A) RC coupling
 - ☐ (B) transformer coupling
 - ☐ (C) direct coupling
 - ☐ (D) zero coupling
64. The signal generator generally used in the laboratories is _____ oscillator.
- ☒ (A) Wien-bridge
 - ☐ (B) Hartley
 - ☐ (C) Crystal
 - ☐ (D) Hartley and crystal both
65. In a LC transistor oscillator, the active device is
- ☐ (A) LC tank circuit
 - ☐ (B) Biasing circuit
 - ☒ (C) Transistor
 - ☒ (D) LC tank circuit and biasing circuit
66. The values of negative feedback fraction are always
- ☒ (A) less than 1
 - ☐ (B) more than 1
 - ☐ (C) equal to 1
 - ☐ (D) zero

67. The microprocessor of a computer can operate on any information if it is present in _____ only.

(A) Program Counter

(B) Flag

(C) Main Memory

(D) Cache Memory

68. Which of the following technology was used by Intel to design its first 8-bit microprocessor?

(A) NMOS

(B) HMOS

(C) PMOS

(D) TTL

69. Current is converted to voltage

(A) through a voltmeter

✓ (B) through a resistance

(C) through an ammeter

(D) through a galvanometer

70. For resistance measurement, meter contains

(A) high current source

(B) medium current source

✓ (C) low current source

(D) low voltage source

71. Which of the following is the correct relationship between speed of light (c) in vacuum and frequency of light (f)? (λ is the wavelength)

✓ (A) $c = f \lambda$

(B) $c = f$

(C) $\lambda = cf$

(D) $c = \lambda^2$

72. The gain of the first order low pass filter

- ☐ (A) Increases at the rate 20 dB/decade
- ☐ (B) Increases at the rate 40 dB/decade
- ☒ (C) Decreases at the rate 20 dB/decade
- ☐ (D) Decreases at the rate 40 dB/decade

73. What is the time period of the function $x[n] = \exp(jwn)$?

- ☐ (A) $\pi/2w$
- ☐ (B) π/w
- ☒ (C) $2\pi/w$
- ☐ (D) $4\pi/w$

74. What is the nature of the following function : $y[n] = y[n-1] + x[n]$?

- ☐ (A) Integrator
- ☒ (B) Differentiator
- ☐ (C) Subtractor
- ☒ (D) Accumulator

75. Sampling is necessary:

- ☐ (A) In complex control systems
- ☒ (B) Where high accuracy is required
- ☐ (C) In Non-automated control systems
- ☐ (D) In Automated control system