

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO

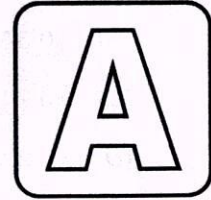
Test Booklet No. :

Series

00117

TEST BOOKLET

ELECTRONICS ENGINEERING



Time Allowed : 2 Hours

Full Marks : 200

Read the following instructions carefully before you begin to answer the questions :

1. The name of the Subject, Roll Number as mentioned in the Admission Certificate, Test Booklet No. and Series are to be written legibly and correctly in the space provided on the Answer-Sheet with Black/Blue ballpoint pen.
2. Answer-Sheet without marking Series as mentioned above in the space provided for in the Answer-Sheet shall not be evaluated.
3. All questions carry equal marks.

The Answer-Sheet should be submitted to the Invigilator.

Directions for giving the answers : Directions for answering questions have already been issued to the respective candidates in the 'Instructions for marking in the OMR Answer-Sheet' along with the Admit Card and Specimen Copy of the OMR Answer-Sheet.

Example :

Suppose the following question is asked :

The capital of Bangladesh is

- (A) Chennai
- (B) London
- (C) Dhaka
- (D) Dhubri

You will have four alternatives in the Answer-Sheet for your response corresponding to each question of the Test Booklet as below :

(A) (B) (C) (D)

In the above illustration, if your chosen response is alternative (C), i.e., Dhaka, then the same should be marked on the Answer-Sheet by blackening the relevant circle with a Black/Blue ballpoint pen only as below :

(A) (B) (C) (D)

The example shown above is the only correct method of answering.

4. Use of eraser, blade, chemical whitener fluid to rectify any response is prohibited.
5. Please ensure that the Test Booklet has the required number of pages (16) and 100 questions immediately after opening the Booklet. In case of any discrepancy, please report the same to the Invigilator.
6. No candidate shall be admitted to the Examination Hall/Room 20 minutes after the commencement of the examination.
7. No candidate shall leave the Examination Hall/Room without prior permission of the Supervisor/Invigilator. No candidate shall be permitted to hand over his/her Answer-Sheet and leave the Examination Hall/Room before expiry of the full time allotted for each paper.
8. No Mobile Phone, Electronic Communication Device, etc., are allowed to be carried inside the Examination Hall/Room by the candidates. Any Mobile Phone, Electronic Communication Device, etc., found in possession of the candidate inside the Examination Hall/Room, even if on off mode, shall be liable for confiscation.
9. No candidate shall have in his/her possession inside the Examination Hall/Room any book, notebook or loose paper, except his/her Admission Certificate and other connected papers permitted by the Commission.
10. Complete silence must be observed in the Examination Hall/Room. No candidate shall copy from the paper of any other candidate, or permit his/her own paper to be copied, or give, or attempt to give, or obtain, or attempt to obtain irregular assistance of any kind.
11. This Test Booklet can be carried with you after answering the questions in the prescribed Answer-Sheet.
12. Noncompliance with any of the above instructions will render a candidate liable to penalty as may be deemed fit.
13. No rough work is to be done on the OMR Answer-Sheet. You can do the rough work on the space provided in the Test Booklet.

N.B. : There will be negative marking @ 0.25 per 1 (one) mark against each wrong answer.

1. The cut-in voltage of a silicon diode is approximately
 - (A) +0.1 V
 - (B) +0.3 V
 - (C) +0.7 V
 - (D) +1.2 V
2. The β of a transistor is the ratio of
 - (A) collector current to emitter current
 - (B) collector current to base current
 - (C) emitter current to base current
 - (D) base current to collector current
3. To obtain *p*-type germanium, the germanium should be doped with a
 - (A) trivalent impurity
 - (B) tetravalent impurity
 - (C) pentavalent impurity
 - (D) Any of the above will do
4. The Miller effect capacitance occurs in
 - (A) common base
 - (B) common emitter
 - (C) common collector
 - (D) emitter follower
5. In Intel 8085 microprocessor, MOV A, B means
 - (A) copies A to B
 - (B) copies B to A
 - (C) adds A and B
 - (D) subtracts B from A
6. The energy band gap of silicon is
 - (A) 1.1 eV
 - (B) 0.7 eV
 - (C) 1.5 eV
 - (D) 2.2 eV
7. In half adder, the sum is obtained by
 - (A) AND gate
 - (B) OR gate
 - (C) XOR gate
 - (D) NAND gate
8. Which logic family has the lower power dissipation?
 - (A) RTL
 - (B) DTL
 - (C) TTL
 - (D) CMOS

9. JFET is a
- (A) current-controlled device
 - (B) voltage-controlled device
 - (C) power device
 - (D) switch only
10. The forward current gain of a BJT is denoted by
- (A) α
 - (B) β
 - (C) γ
 - (D) δ
11. Thevenin's theorem replaces a circuit by
- (A) Norton's equivalent
 - (B) only resistance
 - (C) voltage source and series resistance
 - (D) current source and parallel resistance
12. Superposition theorem is valid for
- (A) linear circuits
 - (B) non-linear circuits
 - (C) Both of the above
 - (D) None of the above
13. In Boolean algebra, $A + A'$ is equal to
- (A) A
 - (B) A'
 - (C) 0
 - (D) 1
14. A $J-K$ flip-flop in toggle mode acts as a
- (A) latch
 - (B) buffer
 - (C) decoder
 - (D) counter
15. Which material is used in LEDs?
- (A) Si
 - (B) Ge
 - (C) GaAs
 - (D) Cu
16. A system is stable if
- (A) ROC includes $j\omega$ -axis
 - (B) poles are in RHS
 - (C) zeros are in LHS
 - (D) poles are at infinity

17. The Fourier transform of $\delta(t)$ is

- (A) 1
- (B) $j\omega$
- (C) 0
- (D) $e^{-j\omega t}$

18. Nyquist rate is

- (A) half the highest frequency
- (B) equal to bandwidth
- (C) equal to sampling period
- (D) twice the highest frequency

19. The window used in FIR filter design to minimize ripple is

- (A) rectangular
- (B) Dirichlet
- (C) cosine
- (D) hamming

20. z-transform is mainly applied for

- (A) continuous systems
- (B) discrete systems
- (C) random signals
- (D) filters

21. An oscillator requires

- (A) positive feedback
- (B) amplifier only
- (C) negative feedback
- (D) diode

22. An ideal op-amp has

- (A) infinite input resistance
- (B) zero gain
- (C) zero input resistance
- (D) infinite output resistance

23. For Laplace transform, ROC must be

- (A) LHS
- (B) RHS
- (C) dependent on signal
- (D) everywhere

24. A band-pass filter passes

- (A) all frequencies
- (B) low frequencies
- (C) high frequencies
- (D) a range of frequencies

25. In R - L - C series circuit, resonance occurs when

- (A) $X_L = X_C$
- (B) $X_L > X_C$
- (C) $X_L < X_C$
- (D) $R = 0$

26. Feedback in amplifiers is used to

- (A) increase gain
- (B) stabilize gain
- (C) increase distortion
- (D) None of the above

27. The Laplace transform of unit step signal $u(t)$ is

- (A) 1
- (B) $\frac{1}{s}$
- (C) s
- (D) e^s

28. A Schmitt trigger is used as a/an

- (A) amplifier
- (B) oscillator
- (C) wave-shaping circuit
- (D) counter

29. In AM, the bandwidth required is

- (A) f_m
- (B) $2 f_m$
- (C) $4 f_m$
- (D) None of the above

30. FM is more immune to

- (A) noise
- (B) distortion
- (C) fading
- (D) phase shift

31. Shannon's capacity theorem is

- (A) $C = B \log_2 \left(1 + \frac{S}{N} \right)$
- (B) $C = \frac{S}{N}$
- (C) $C = 2B \log_2 \left(\frac{S}{N} \right)$
- (D) None of the above

32. CRC is used for

- (A) encryption
- (B) error detection
- (C) multiplexing
- (D) compression

33. The impulse response $h(t)$ of an LTI system is

- (A) Fourier transform
- (B) output for step signal $u(t)$
- (C) output for $\delta(t)$
- (D) output for ramp signal

34. A signal is energy signal if it has

- (A) finite energy
- (B) finite power
- (C) Both of the above
- (D) None of the above

35. Hilbert transform is used for

- (A) phase shift
- (B) amplitude shift
- (C) noise removal
- (D) filtering

36. The matched filter maximizes

- (A) noise
- (B) SNR
- (C) power
- (D) distortion

37. Gray coding is used to

- (A) reduce error
- (B) increase error
- (C) increase speed
- (D) None of the above

38. Companding in PCM reduces

- (A) bandwidth
- (B) transmission speed
- (C) quantization error
- (D) All of the above

39. In QPSK, information is carried by

- (A) amplitude
- (B) frequency
- (C) phase
- (D) None of the above

40. Eye diagram helps in

- (A) power measurement
- (B) noise
- (C) ISI analysis
- (D) filter design

41. Manchester coding is a type of

- (A) phase encoding
- (B) frequency encoding
- (C) amplitude encoding
- (D) None of the above

42. The duty cycle is a ratio of

- (A) OFF/ON time
- (B) ON time/total time
- (C) voltage/time
- (D) current/time

43. The first cellular generation (1G) was

- (A) analog
- (B) digital
- (C) hybrid
- (D) satellite

44. Loss in optical fiber is due to

- (A) attenuation
- (B) amplification
- (C) filtering
- (D) crosstalk

45. Multipath propagation leads to

- (A) interference
- (B) fading
- (C) noise
- (D) jitter

46. In 8051, timers are

- (A) 8-bit
- (B) 12-bit
- (C) 16-bit
- (D) 32-bit

47. Channel length modulation occurs in

- (A) BJT
- (B) MOSFET
- (C) diode
- (D) JFET

48. EPROM stands for

- (A) electronic ROM
- (B) extended ROM
- (C) electrically erasable ROM
- (D) None of the above

49. Cache memory is
- (A) primary
 - (B) secondary
 - (C) virtual
 - (D) high-speed buffer
50. A pipeline in processor improves
- (A) cost
 - (B) noise
 - (C) power
 - (D) speed
51. In 8086, AX register is
- (A) 8-bit
 - (B) 16-bit
 - (C) 32-bit
 - (D) 64-bit
52. DMA stands for
- (A) Digital Memory Access
 - (B) Data Memory Application
 - (C) Direct Memory Access
 - (D) None of the above
53. The half-wave dipole antenna length is
- (A) λ
 - (B) $\frac{\lambda}{2}$
 - (C) $\frac{\lambda}{4}$
 - (D) $\frac{\lambda}{8}$
54. VSWR stands for
- (A) Voltage System With Reflection
 - (B) Voltage Signal Wave Ratio
 - (C) Variable Signal Wave Ratio
 - (D) Voltage Standing Wave Ratio
55. Rectangular waveguides support
- (A) TEM
 - (B) TE and TM
 - (C) only TE
 - (D) only TM
56. Horn antenna is
- (A) omnidirectional
 - (B) directional
 - (C) indoor
 - (D) matching

57. Microwave frequency range is

- (A) 300 MHz to 3 GHz
- (B) 3–30 GHz
- (C) 30–300 GHz
- (D) Both (B) and (C) are correct

58. Cavity resonators are used in

- (A) audio devices
- (B) DC circuits
- (C) microwaves
- (D) optical devices

59. Friis equation relates to

- (A) link budget
- (B) voltage gain
- (C) power loss
- (D) noise

60. Yagi antenna is a type of

- (A) parabolic antenna
- (B) loop antenna
- (C) horn antenna
- (D) array antenna

61. Antenna gain is a ratio of

- (A) radiation intensity to input power
- (B) radiation intensity to isotropic gain
- (C) directivity to efficiency
- (D) None of the above

62. Satellite communication uses

- (A) HF
- (B) VHF
- (C) microwave frequency
- (D) optical frequency

63. A phased array antenna

- (A) can change beam direction electronically
- (B) can change beam direction mechanically
- (C) cannot change direction
- (D) None of the above

64. Which one of the following types of instruments will be used for AC measurements (current, voltage, power and energy)?

- (A) Induction coil
- (B) Moving coil dynamometer
- (C) Moving coil permanent magnet
- (D) Moving iron

65. Waveguide cut-off frequency depends on
- (A) dimensions
 - (B) material
 - (C) power
 - (D) load
66. Slot antenna is a type of
- (A) wire antenna
 - (B) printed antenna
 - (C) aperture antenna
 - (D) reflector
67. Polarization of EM wave is
- (A) direction of E -field
 - (B) direction of H -field
 - (C) propagation direction
 - (D) frequency
68. Dielectric constant affects
- (A) antenna gain
 - (B) wavelength
 - (C) radiation efficiency
 - (D) All of the above
69. Diversity techniques in communication combat
- (A) ISI
 - (B) noise
 - (C) fading
 - (D) distortion
70. The type of microwave diode used in oscillator is
- (A) Zener
 - (B) tunnel
 - (C) PIN
 - (D) Schottky
71. Spectrum analyzers work in
- (A) time domain
 - (B) frequency domain
 - (C) voltage measurement
 - (D) power measurement
72. Phase-locked loop (PLL) is used in
- (A) demodulation
 - (B) modulation
 - (C) Both of the above
 - (D) None of the above

73. Successive approximation ADC is

- (A) fast
- (B) slow
- (C) Both of the above
- (D) None of the above

74. FFT reduces complexity from

- (A) N^2 to $N \log N$
- (B) N to $\log N$
- (C) $N \log N$ to N
- (D) None of the above

75. Instrumentation amplifier is based on

- (A) op-amp
- (B) transistor
- (C) diode
- (D) FET

76. Q-factor in filters measures

- (A) gain
- (B) loss
- (C) phase
- (D) bandwidth

77. In DSP, aliasing occurs due to

- (A) noise
- (B) quantization
- (C) low sampling rate
- (D) high sampling rate

78. FIR filters are always

- (A) stable
- (B) unstable
- (C) causal
- (D) non-causal

79. A transducer converts

- (A) energy into power
- (B) signal into noise
- (C) one form of energy into another
- (D) None of the above

80. DAQ system stands for

- (A) data acquisition
- (B) digital audio quality
- (C) data analysis queue
- (D) None of the above

81. In SSB modulation, the bandwidth is

(A) f_m

(B) $2 f_m$

(C) $\frac{f_m}{2}$

(D) $3 f_m$

82. The modulation index of FM is

(A) $\frac{f_m}{\Delta f}$

(B) $\frac{\Delta f}{f_m}$

(C) $\Delta f \times f_m$

(D) None of the above

83. For an FET with $g_m = 2 \text{ mA/V}$, $V_{GS} = 1 \text{ V}$, I_d is

(A) 1 mA

(B) 2 mA

(C) 0.5 mA

(D) 4 mA

84. A Zener diode of 6 V has 50Ω series resistor. The input is 12 V. The Zener current is

(A) 60 mA

(B) 100 mA

(C) 120 mA

(D) 150 mA

85. The transfer function

$$H(z) = \frac{1}{1 - 0.5z^{-1}}$$

is

(A) FIR

(B) IIR

(C) all-pass

(D) None of the above

86. The circular convolution of [1, 2, 3, 4] and [1, 1, 1, 1] with $N = 4$ yields

(A) [10, 10, 10, 10]

(B) [1, 2, 3, 4]

(C) [4, 6, 6, 4]

(D) [0, 0, 0, 0]

87. The DFT of $\delta(n-1)$, for $N=4$, is

- (A) [1, 1, 1, 1]
- (B) [0, 1, 0, 0]
- (C) [1, +j, -1, -j]
- (D) None of the above

88. The 2's complement representation of 18 in 6 bits is

- (A) 101110
- (B) 110110
- (C) 111010
- (D) None of the above

89. For $H(z) = 1 - 0.5z^{-1}$, pole-zero plot has

- (A) zero at origin, pole at 0.5
- (B) zero at 0.5, pole at origin
- (C) zero at 2, pole at 0
- (D) None of the above

90. For 4-point DFT, $W_N = e^{\frac{-j2\pi}{N}}$, W_4^2 is

- (A) 1
- (B) -1
- (C) j
- (D) -j

91. For a p-n junction, the built-in potential V_{bi} at $T=300$ K, $N_A = 10^{16}$, $N_D = 10^{16}$, $n_i = 1.5 \times 10^{10}$ is

- (A) 0.9 V
- (B) 0.25 V
- (C) 0.59 V
- (D) 1.2 V

92. A silicon diode has a saturation current $I_s = 10^{-12}$ A at 300 K. If the forward voltage is 0.7 V, the current is

- (A) 0.1 mA
- (B) 1 mA
- (C) 10 mA
- (D) 100 mA

93. For LED with $\lambda = 850$ nm, the band gap energy is

- (A) 1.46 eV
- (B) 0.85 eV
- (C) 2 eV
- (D) 1 eV

94. A raised cosine filter with roll-off factor $\alpha = 0.5$, symbol rate = 1 Msps, the bandwidth is
- (A) 0.5 MHz
 - (B) 0.85 MHz
 - (C) 1 MHz
 - (D) 0.75 MHz
95. If the signal power is 10 mW, noise power is 1 mW, the SNR is
- (A) 5 dB
 - (B) 10 dB
 - (C) 20 dB
 - (D) 30 dB
96. A plane wave propagates in a medium with $\epsilon_r = 2.25$, $\mu_r = 1$. The phase velocity is
- (A) 3×10^8 m/s
 - (B) 2×10^8 m/s
 - (C) 1.5×10^8 m/s
 - (D) 1×10^8 m/s
97. The minimum number of flip-flop's for a modulo-125 synchronous counter (binary) is
- (A) 6
 - (B) 7
 - (C) 8
 - (D) 9
98. An inverting amplifier has $R_f = 100 \text{ k}\Omega$, $R_{in} = 10 \text{ k}\Omega$. The closed-loop gain is
- (A) +10
 - (B) -10
 - (C) -100
 - (D) +100
99. A half-wave rectifier is equivalent to a
- (A) clamper circuit
 - (B) clipper circuit
 - (C) voltage regulator
 - (D) voltage amplifier
100. A transmission line is distortionless if
- (A) $RL = \frac{1}{RC}$
 - (B) $RL = GC$
 - (C) $GL = RC$
 - (D) $RG = LC$

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