Ph.D.–2051

ELECTRONIC SCIENCE (ALLIED)
ENTRANCE TEST, MARCH 2020

Time : 2 Hours   Maximum Marks : **200**

Number of Pages in this Booklet : **24**   Number of Questions in this Booklet : **100**

INSTRUCTIONS FOR THE CANDIDATES

(i)   Check this booklet carefully for the sequence of pages and questions. If it is defective due to pages/questions missing or not in serial order or any other discrepancy it should be got replaced immediately from the invigilator within the period of 5 minutes. Afterwards neither the Question Booklet will be replaced nor any extra time will be given.

(ii)   After this verification write your Roll No. and OMR Sheet Number on this Question Booklet.

(iii)   **Use only Black or Blue ball point pen.**

(iv)   This paper consists of **100** multiple choice type questions. Each question has four alternative answers (a), (b), (c) and (d). **Only one of these alternative answer is correct**. You are required to darken completely the circle of correct answer in the OMR Sheet.

(v)   There is **no negative marking.**

(vi)   Do not write anything other than relevant entries or put any mark on any part of the OMR Sheet, which may disclose your identity, otherwise you will render yourself liable to disqualification.

(vii)   Use of electronic gadgets such as pager, cell phone, calculator and log table etc. is prohibited.

(viii) Rough Work may be done in the end of this booklet.

(ix)   You have to **return the OMR Sheet** to the invigilator at the end of the examination compulsorily.

SEAL

1. Newton Raphson method is also called as

   (a) Tangent method

   (b) Secant method

   (c) Chord method

   (d) Diameter method.

2. The equation $f(x)$ is given as $x^2 - 4 = 0$. Considering the initial approximation at $x = 6$ then the value of x_1 is given as

   (a) 10/3

   (b) 4/3

   (c) 7/3

   (d) 13/3.

3. In Newton Raphson method $f'(x)$ for a given point is given by the formula

   (a) y/x'

   (b) y'/x

   (c) y/x

   (d) y'/x'.

4. A Laplace Transform exists when

   (A) The function is piece-wise continuous

   (B) The function is of exponential order

   (C) The function is piecewise discrete

   (D) The function is of diffetential order.

   (a) A and B

   (b) C and D

   (c) A and D

   (d) B and C.

5. What should be the value of Laplace transform for the time-domain signal equation $e^{-at} \cos(\omega t).u(t)$?

   (a) $1/s + a$ with ROC $\sigma > -a$

   (b) $\omega/(s + a)^2 + \omega^2$ with ROC $\sigma > -a$

   (c) $s + a/(s + a)^2 + \omega^2$ with ROC $\sigma > -a$

   (d) $A\omega/s^2 + \omega^2$ with ROC $\sigma > 0$.

6. For a voltage source

   (a) Terminal voltage is always lower than source e.m.f.

   (b) Terminal voltage cannot be higher than source e.m.f.

   (c) The source e.m.f. and terminal voltage are equal

   (d) None of these.

7. For high efficiency of transfer of power, internal resistance of the source should be

   (a) Equal to the load resistance

   (b) Less than the load resistance

   (c) More than the load resistance

   (d) None of the above.

8. In Thevenin's theorem, to find Z

   (a) All independent current sources are short circuited and independent voltage sources are open circuited

   (b) All independent voltage sources are open circuited and all independent current sources are short circuited

   (c) All independent voltage and current sources are short circuited

   (d) All independent voltage sources are short circuited and all independent current sources are open circuited.

9. To determine the polarity of the voltage drop across a resistor, it is necessary to known

   (a) Value of current through the resistor

   (b) Direction of current through the resistor

   (c) Value of resistor

   (d) E.m.f. in the circuit.

10. Kirchhoff's current law is applicable to only

   (a) Junction in a network   (b) Closed loops in a network

   (c) Electric circuits   (d) Electornic circuits.

11. A capacitor is generally a

    (a) Bilateral and active component

    (b) Active, passive, linear and non-linear component

    (c) Linear and bilateral component

    (d) Non-linear and active component.

12. The theorem that enables a number of voltage (or current) sources to be combined directly into a single voltage (or current) source is the .... theorem.

    (a) Compensation   (b) Reciprocity

    (c) Milliman's   (d) Maxwell's.

13. Three equal resistance are connected in star. If this star is converted into equivalent delta, the resistance of both the networks will be

    (a) Equal   (b) Zero

    (c) Vive-versa   (d) None of the above.

14. A tree in a network has a

    (a) Closed path   (b) No closed path

    (c) No nodes   (d) No branches.

15. Dispersion shifted wave length is

    (a) 800 nm   (b) 1550 nm

    (c) 1310 nm   (d) 1200 nm.

16. The transfer function of RC low-pass filter network

    (a) RCs/1 + RCs   (b) 1/1 + RCs

    (c) RC/1 + RCs   (d) S/1 + RCs.

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

(a) 2.5 GHz

(b) 2.5 MHz

(c) 20.5 GHz

(d) 5 GHz.

18. Expansion of RISC is

(a) Reduced Integrated Systems Circuit

(b) Reduced Instructions Set Computer

(c) Reduction Integrated System Computer

(d) Reduced Instructions System Circuit.

19. 8 bit date lines are not employed by the following processor

(a) 8080

(b) 8085

(c) 8086

(d) 8051.

20. The p-n junction diode is a

(a) Passive device

(b) Vacuum device

(c) Unilateral device

(d) Bilateral device.

21. The superposition theorem is essentially based on the concept of

(a) Quality

(b) Linearity

(c) Reciprocity

(d) Non-linearity.

22. A semiconductor has .... temperature co-efficient of resistance.

(a) Zero

(b) Positive

(c) Negative

(d) One.

23. In 8085, microprocessor, the register which holdes the address of the next instruction to be executed is

   (a) Instruction registers
   (b) Stack pointer
   (c) Temporary register
   (d) Program counter.

24. In a normal ECG waveform which wave has the maximum amplitude?

   (a) P wave
   (b) R wave
   (c) Q wave
   (d) T wave.

25. Which data communication method is used for sending data in both directions at the same time?

   (a) Super duplex
   (b) Simplex
   (c) Half duplex
   (d) Full duplex.

26. The highest data rate in fiber optic communication occurs in

   (a) Single-mode fiber
   (b) Graded-index fiber
   (c) Multimode fiber
   (d) Co-axial cable.

27. Following are the process steps to fabricate an IC

   (1) Crystal growth

   (2) Epitaxial growth

   (3) Photo etching

   (4) Diffusion

   (5) Vacuum evaporation of Aluminium.

   The correct sequence of fabrication is

   (a) 1, 5, 3, 4, 2
   (b) 1, 2, 3, 4, 5
   (c) 1, 3, 2, 4, 5
   (d) 1, 2, 4, 3, 5.

28. When a reverse bias is applied to a junction diode

    (a)   Potential barrier is lowered

    (b)   Majority carrier current is increased

    (c)   Minority carrier current is increased

    (d)   Potential barrier is raised.

29. In a JFET the change in drain current is due to the applied

    (a)   Electric field between S and D

    (b)   Electric field between G and S

    (c)   Magnetic field between S and D

    (d)   Magnetic field between G and S.

30. Thevenin's theorem replaces a complicated circuit facing a load by an

    (a)   Ideal voltage source and parallel resistor

    (b)   Ideal current source and parallel resistor

    (c)   Ideal current source and series resistor

    (d)   Ideal voltage source and series resistor.

31. Among the following the slowest ADC (Analong-to-digital converter) is

    (a)   Parallel-comparator (i.e.) flash type

    (b)   Successive approximation type

    (c)   Integrating type

    (d)   Counting type.

32. The step-index monomode filter has diameter

(a) $< 10 \ \mu m$ (b) $50 \ \mu m$

(c) $100 \ \mu m$ (d) $200 \ \mu m$.

33. The phase shift introduced by feed network or amplifier in Wein bridge oscillator is

(a) $0°$ (b) $90°$

(c) $180°$ (d) $270°$.

34. DIAC is a

I.   2 terminal unidirectional switch

II. 2 terminal bi-directional switch

III. 3 layers and no gate device

IV. 4 layers and no gate device.

(a) Options II and III are correct   (b) Options II and IV are correct

(c) Options I and III are correct   (d) Options I and IV are correct.

35. The following frequency bands are used in microwaves

I.   Ku band

II. Ka band

III. L band

IV. C band.

The correct sequence in decreasing frequency is by

(a) II, III, IV, I   (b) I, II, III, IV

(c) II, I, III, IV   (d) II, I, IV, III.

36. NAND gate is also called as

   (a) Bubbled AND gate   (b) Bubbled OR gate

   (c) Bubbled NOR gate   (d) Bubbled XOR gate.

37. 8085 microprocessor does not have

   (a) Zero flag   (b) Sign flag

   (c) Parity flag   (d) Overflow flag.

38. The time base of a CRO is controlled by

   (a) Square waveform   (b) Sine waveform

   (c) Sawtooth waveform   (d) Staircase waveform.

39. The Reflex Klystron can be used as

   (a) Amplifier only   (b) Oscillator only

   (c) Both amplifier and oscillator   (d) Neither amplifier nor oscillator.

40. The Laplace transform of $\sin^2 (3t)$ is given by

   (a) $18/[s(s^2 + 36)]$ (b) $6/(s^2 + 36)$

   (c) $18(s + 6)/[s(s^2 + 36)]$ (d) $1/[6s(s^2 + 36)]$.

41. The Fourier Transform of a Gaussian time pulse is

   (a) Uniform   (b) A pair of impulse

   (c) Gaussian   (d) Rayleigh.

42. Negative feedback in amplifier results is

(i)   Reduced voltage gain

(ii) Reduced sensitivity

(iii) Decreased bandwidth

(iv) Reduced distortion.

Of these statements :

(a) (i) and (ii) are correct

(b) (i), (ii) and (iii) are correct

(c) (i), (ii) and (iv) are correct

(d) (i) and (iv) are correct.

43. Arrange the following in order of increasing the input impedances

(1) BJT CE stage

(2) BJT in CB stage

(3) BJT in CC stage

(4) CMOS.

The correct sequence is given by

(a) 2, 1, 3, 4

(b) 4, 2, 1, 3

(c) 4, 3, 2, 1

(d) 3, 1, 2, 4.

44. Indicate which of the following diodes does not use negative resistance in its operation

(a) Backward

(b) Gunn

(c) IMPATT

(d) Tunnel.

45. Which of the following oscillations makes use of both positive and negative feedback?

(a) Hartley

(b) Collpitt

(c) Phase shift

(d) Wein Bridge.

46. Which flip-flop can be used as latch?

    (a)   R-S Flip-flop

    (b)   J-K Flip-flop

    (c)   T-Flip-flop

    (d)   D-Flip-flop.

47. Which flag of 8051 works as 1-bit accumulator?

    (a)   C

    (b)   FO

    (c)   P

    (d)   OV.

48. .... diode is not used as a microwave mixer or detector.

    (a)   Schottky diode

    (b)   PIN

    (c)   Crystal

    (d)   Backward.

49. Pointer Vector for an electromagnetic wave is (H and E are vectors)

    (a) $H \cdot E$

    (b) $H \times E$

    (c) $E \times H$

    (d) $E \cdot H$.

50. Which of the following are Maxwell questions?

    1. $B = \mu H$

    2. $E = D\epsilon$

    3. $E = J\sigma$

    4. $E = \epsilon D$

Select the correct answer :

    (a)   1, 2 and 3

    (b)   2, 3 and 4

    (c)   3 and 2

    (d)   3 and 1.

51. In comparison to LED, LASER has

    1.   high emission frequency

    2.   no tuning arrangement

    3.   narrow spectral bandwidth

    4.   provision for confinement of these

    (a)   1, 3 and 4 are correct   (b)   1, 2 and 4 are correct

    (c)   1 and 3 are correct   (d)   2, 3 and 4 are correct.

52. If P → Passivation, Q → n-well implant, R → Metallization and S → Source/drain diffusion. The sequence in which these are carried out in a n-channel CMOS fabrication is

    (a)   P – Q – R – S   (b)   Q – S – R – P

    (c)   R – P – S – Q   (d)   S – R – Q – P.

53. Which of the following logic family is fastest of all?

    (a)   TTL   (b)   RTL

    (c)   DCTL   (d)   ECL.

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

    (a)   BPSK   (b)   FSK

    (c)   QPSK   (d)   QAM.

55. The figure of merit of logic family is given by

    (a)   grain bandwidth product

    (b)   (propagation delay time) × (power dissipation)

    (c)   (fan out) × (propagation delay time)

    (d)   (noise margin) × (power dissipation).

56. A transducer converts

1. A potential differences is devloped across a current carrying metal strip when the strip is placed in transverse magnetic field.

2. The Hall effect is very weak in metals but large in semiconductors.

3. The Hall effect is very weak in semiconductors but is large in metals.

4. It is applied in the measurement of the magnetic field intensity.

Codes :

(a) 1, 2 and 3 only

(b) 2 and 4 only

(c) 1, 3 and 4 only

(d) 1, 2 and 4 only.

57. 8051 series has how many 16 bit registers?

(a) 2

(b) 3

(c) 1

(d) 0.

58. What is the function of the SCON register?

(a) to control SBUF and SMOD registers

(b) to program the start bit, stop bit, and data bits of framing

(c) to control SMOD registers

(d) None of the mentioned.

59. The velocity factor of a transmission line depends on

(a) Temperature

(b) Skin effect

(c) Relative permittivity of dielectric

(d) None of the above.

60. In a circular waveguide the dominat mode is

(a) TE_{01}

(b) TE_{11}

(c) TE_{20}

(d) TE_{21}.

61. Which one of the following is also called 'rat race'?

    (a) E plane tee   (b) H plane tee

    (c) Magic tee   (d) Hybrid ring.

62. In an optional fiber the refractive index of cladding material should be

    (a) Nearly 1   (b) Very low

    (c) Less than that of core   (d) More than that of core.

63. Which of the following types of noise assumes greater importance at high frequencies?

    (a) Transit time noise   (b) Shot noise

    (c) Impulse noise   (d) Random noise.

64. Qunantizing error occurs in

    (a) TDM   (b) FDM

    (c) PCM   (d) PWD.

65. The resonant frequency of an RF amplifier is 1 MHz and its bandwidth is 10 kHz. The Q factor will be

    (a) 10   (b) 100

    (c) 0.01   (d) 0.1.

66. In a CRO which of the following is not a part of electron gun?

    (a) Cathode   (b) Grid

    (c) Accelerating anode   (d) X–Y plates.

67. LVDT is a

(a) Pressure transducer

(b) Displacement transducer

(c) Velocity transducer

(d) Acceleration transducer.

68. Heating effect of current is used in

(a) Ammeters

(b) Voltmeters

(c) Both ammeters and voltmeters

(d) Wattmeters.

69. In a CRO, the time base signal is applied to

(a) X plates

(b) Y plates

(c) Either X or Y plates

(d) Alternately X and Y plates.

70. In a superheterodyne receiver

(a) The IF stage has better selectivity than RF stage

(b) The RF stage has better selectivity than IF stage

(c) The RF stage has same selectivity than IF stage

(d) None of the above.

71. Most popular IF for receivers tuning to 540 to 1650 kHZ is

(a) 433 kHz

(b) 455 kHz

(c) 545 kHz

(d) 555 kHz.

72. $Z_L = 200\,\Omega$ and it is desired that $Z_i = 50\,\Omega$. The quarter was transformer should have a characteristic impedance of

(a) $100\,\Omega$

(b) $40\,\Omega$

(c) $10000\,\Omega$

(d) $4\,\Omega$.

73. The intrinsic impedance of free space

    (a)   Increases with increase of frequency

    (b)   Decreases with increase of frequency

    (c)   Is independent of frequency

    (d)   None of the above.

74. Pre-emphasis circuit is used

    (a)   After modulation   (b)   Before modulation

    (c)   Before detection   (d)   After detection.

75. A Marconi antenna

    (a)   Is a grounded antenna with a length equal to $\lambda/4$

    (b)   Is an ungrounded antenna with a length equal to $\lambda/4$

    (c)   Has a length equal to 1

    (d)   Has a length equal to $\lambda/2$.

76. In FM 'guard band' is provided

    (a)   Limit upper frequency limit

    (b)   To limit lower frequency limit

    (c)   So that there is less adjacent channel interference

    (d)   To limit transmitted power of a station.

77. P-well is created on

    (a)   p substrate   (b)   n substrate

    (c)   p & n substrate   (d)   None of the mentioned.

78. In CMOS fabrication, the photoresist layer is exposed to

(a) Visible light

(b) Ultraviolet light

(c) Infra red light

(d) Fluorescent.

79. A two port network is described by the relation

$$V_1 = 2I_1 + 3V_2$$

$$I_2 = -I_1 + 2V_2.$$

Then Z-parameter of such network is

(a) $\begin{bmatrix} 2 & 3 \\ -1 & 2 \end{bmatrix}$

(b) $\begin{bmatrix} 3.5 & 1.5 \\ 0.5 & 0.5 \end{bmatrix}^{-1}$

(c) $\begin{bmatrix} 2 & 3 \\ -1 & 2 \end{bmatrix}^{-1}$

(d) $\begin{bmatrix} 3.5 & 1.5 \\ 0.5 & 0.5 \end{bmatrix}.$

80. In amplitude modulation, carrier signals $A \cos(\omega t)$ has its amplitude A modulated in proportion with message bearing (low frequency) signal $m(t)$. The magnitude of $m(t)$ is chosen to be,

(a) Less than 1

(b) Less than or equal to 1

(c) More than 1

(d) None of these.

81. The cut off voltage for JFET is 5 V. The pinch off voltage is

(a) $-(5.0)1/2$ V

(b) -2.5 V

(c) V

(d) -5 V.

82. JFET has the disadvantage of

(a) Having low input impedance

(b) Having high input impedance

(c) Having small gain band-width product

(d) Possessing positive temperature coefficient.

83. The capacitance of reverse biased P–N junction

(a) Decreases with increasing the reverse bias

(b) Increases with increasing the reverse bias

(c) Depends only on reverse saturation current

(d) Makes the P–N junction more effective at high frequencies.

84. The permeability of a diamagnetic material is

(a) Zero

(b) Less than 1

(c) Equal to a

(d) More than 1.

85. In a bridge rectifier

(a) PIV has a value V_m

(b) Centre tap of secondary is not required

(c) Smaller transformer can be used

(d) All of these.

86. Positive feedback is used in

(a) Amplifier

(b) Rectifier

(c) Oscillator

(d) Detector.

87. In a tunnel diode, electrons can tunnel through the P–N junction mainly because

(a) Impurity level is low

(b) They have high energy

(c) Barrier potential is very low

(d) Depletion layer is extremely thin.

88. The ripple factor of a bridge rectifier is

(a) 0.48

(b) 0.812

(c) 1.11

(d) 1.21.

89. The high level language can be translated into machine language with the help of

(a) Assembler

(b) Stack pointer

(c) Compiler

(d) Multiplexer.

90. The difference between the half power frequencies is called the

(a) Quality factor

(b) Resonant frequency

(c) Bandwidth

(d) Cutoff frequency.

91. In class-A amplifier, the output current flows for

(a) A part of the cycle or the input signal

(b) The full cycle of the input signal

(c) Half the cycle of the input signal

(d) 3/4th of the cycle of the input signal.

92. TRAPATT is used as

(a) Amplifier in radars

(b) Local oscillator in radars

(c) Switch in communication systems

(d) Low frequency oscillator.

93. Tunnel diode is used as

(a) High speed switch

(b) Clipper

(c) Low gain amplifier

(d) Low frequency oscillator.

94. The main advantage of TDM over FDM is that it

(a) Needs less power

(b) Needs less bandwidth

(c) Needs simple circuitry

(d) Gives better signal / noise ratio.

95. A function xyz is defined as

Void xyz (int a = 0, int b, int c = 0)

{

cout << a << b << c;

}

Which of the following calls are illegal? (Assume h, g are declared as integers)

(a) xyz(); (b) xyz (h, h); (c) xyz (h); (d) xyz (g, g);

Codes :

(a)   (a) and (c) are correct   (b)   (b) and (d) are correct

(c)   (a) and (b) are correct   (d)   (b) and (c) are correct.

96. For transmission lines, following statements are given :

(A)   For open circuited transmission line VSWR is ∞

(B)   For short circuited transmission line VSWR is 0

(C)   For short circuited transmission line VSWR is ∞

(D)   The cut off frequency for TEM wave is 0 Hz.

Out of the above statements, following is correct :

(a)   (A), (B)   (b)   (A), (C)

(c)   (A), (B) and (D)   (d)   (A), (C) and (D).

97. Consider the following statements regarding Fourier transform

(A)   The Fourier transform of an impulse function is a constant function

(B)   The Fourier transform of an impulse function is a sine function

(C)   The Fourier transform of a constant function is an impulse function

(D)   The Fourier transform of a constant function is a signum function.

Which of the above statements are correct?

(a)   (A) and (B)   (b)   (B) and (C)

(c)   (B) and (D)   (d)   (A) and (C).

98. The Fermi level for the extrinsic semiconductor (n-type) lies

(a) Close to the middle of the bandgap

(b) Below the conduction band

(c) Above the conduction band

(d) Above the valance band.

99. Pointer arithmetic cannot be performed on

(a) Dangling pointer

(b) Uninitialized pointer

(c) Array name

(d) Void pointer.

100. The following statement of C

X– = Y + 1 does the same as

(a) X = X – Y + 1

(b) X = –X – Y – 1

(c) X = –X + Y + 1

(d) X = X – Y – 1.