ENTRANCE EXAMINATION FOR ADMISSION, MAY 2013.

M.Tech. (ELECTRONICS)

COURSE CODE : 304

Register Number :

Signature of the Invigilator
(with date)

COURSE CODE : 304

Time : 2 Hours Max : 400 Marks

Instructions to Candidates :

1. Write your Register Number within the box provided on the top of this page and fill in the page 1 of the answer sheet using pen.
2. Do not write your name anywhere in this booklet or answer sheet. Violation of this entails disqualification.
3. Read each question carefully and shade the relevant answer (A) or (B) or (C) or (D) in the relevant box of the ANSWER SHEET using HB pencil.
4. Avoid blind guessing. A wrong answer will fetch you –1 mark and the correct answer will fetch 4 marks.
5. Do not write anything in the question paper. Use the white sheets attached at the end for rough works.
6. Do not open the question paper until the start signal is given.
7. Do not attempt to answer after stop signal is given. Any such attempt will disqualify your candidature.
8. On stop signal, keep the question paper and the answer sheet on your table and wait for the invigilator to collect them.
9. Use of Calculators, Tables, etc. are prohibited.

1. A 10 cm long capillary tube is dipped in water. The water rises up to 8 cm. If the entire arrangement is kept in a freely falling elevator, the length of water column in the capillary tube will be:

(A) 8 cm (B) 10 cm (C) 4 cm (D) 20 cm.

2. A particle of mass of 0.3 kg is subjected to a force F= -kx with k=30N/m. What will be the initial acceleration if it is released from a point 40 cm away from the origin?

(A) 3 m/s² (B) 15 m/s² (C) 40 m/s² (D) 10 m/s².

3. If a circle passes through the point (1,2) and cuts the circle $x^2 + y^2 + 2x + 2y + 1 = 0$ orthogonally, then locus of its centre is,

(A) $3x + 2y - 2 = 0$ (B) $2x + 3y - 2 = 0$

(C) $3x - 2y + 2 = 0$ (D) $2x - 2y + 2 = 0$.

4. Given two numbers a and b. Let A denotes the single AM and S denotes the sum of nAMs between a and b, then S/A depends on -

(A) n, a, b (B) n, b (C) n, a (D) n.

5. Percent resolution of a 10 bit ADC is

(A) 1.588% (B) 0.0978% (C) 0.392% (D) 0.0244%.

6. Efficiency of half wave rectifier is

(A) 45% (B) 50% (C) 86% (D) 100%.

7. If a potential of 1V is applied across a capacitor of 10 pF, the energy stored is

(A) 5 PJ (B) 10 PJ (C) 100 PJ (D) 0.01 PJ .

8. If the maximum peak to peak voltage of an AM wave is 16 mV and the minimum peak to peak voltage is 4 mV, then modulation factor is

(A) 0.3 (B) 0.5 (C) 0.6 (D) 0.8.

9. In cellular mobile communication, the frequency reuse distance D is

(A) $\sqrt{3}K . R$ (B) $\sqrt{K} . R$ (C) $\sqrt{3}KR$ (D) $\sqrt{R} . 3K$.

10. The noise figure in dB if the minimum receivable signal in a radar receiver is 4.17×10^{-14} W with IF bandwidth of 1.5 MHz is

(A) 10 dB (B) 9 dB (C) 20 dB (D) 18 dB.

11. The beam width between first null of 2 m parabolic reflector operating at 900 MHz is

(A) 20.3° (B) 21.3° (C) 22.3° (D) 23.3°

12. After a target has been acquired, the best scanning system for tracking is

(A) Linear (B) Spiral (C) Conical (D) Helical.

13. To permit the selection of 1 out of 16 equiprobable events, the number of bits required is

(A) 2 (B) $\log_{10} 16$ (C) 8 (D) 4.

14. The number of lines per second in the United States TV system is

(A) 31,500 (B) 15,750 (C) 262 ½ (D) 525.

15. VDE is, EMC standard of

(A) USA (B) India (C) France (D) Germany.

16. FEM is

(A) Empirical method (B) Numerical method

(C) Analytical method (D) None of these.

17. Impedance inversion may be obtained with

(A) A short circuited stub (B) An open circuited stub

(C) A quarter wave line (D) A half wave line.

18. Tropospheric scatter is used with frequencies in the range

(A) HF (B) VHF (C) UHF (D) VLF.

19. The attenuator is used in the Traveling wave tube to

(A) Help bunching (B) Prevent oscillations

(C) Prevent saturation (D) Increase gain.

20. The biggest advantage of the TRAPATT diode over the IMPATT diode is its

(A) Lower noise

(B) Higher efficiency

(C) Ability to operate at higher frequencies

(D) Lesser sensitivity to harmonics.

21. A tunnel diode is loosely coupled to its cavity in order to

(A) Increase the frequency stability

(B) Increase the available negative resistance

(C) Facilitate tuning

(D) Allow operation at the highest frequencies.

22. The Hartley – Shannon theorem sets a limit on the

(A) Highest frequency that may be sent over a given channel

(B) Maximum capacity of a channel with a given noise level

(C) Maximum number of coding levels in a channel with a given noise level

(D) Maximum number of quantization levels in a channel of a given bandwidth.

23. In order to separate channels in a TDM receiver, it is necessary to use

(A) AND gates (B) Band pass filters

(C) Differentiation (D) Integration.

24. The ---------- should lie in the left half of the S plan for stability

(A) Zeros (B) Poles and Zeros

(C) Poles (D) None of the above.

25. Convert the 101101 Binary number into octal number

(A) 65 (B) 55 (C) 51 (D) 45.

26. How many flip-flops are required to construct Mod -12 counter?

(A) 5 (B) 6 (C) 12 (D) 4.

27. If the output of the gate is always high then the gates applied to this logic are --------- and------.

(A) NAND and EX-NOR (B) NAND and NOR

(C) AND and X-NOR (D) OR and XOR.

28. The largest negative number can be represented with 8 bits in 2's compliment representation.

(A) -256 (B) -255 (C) -127 (D) -128.

29. Transparent latch is seen in which type of flip flop

(A) SR FF (B) D FF (C) JK FF (D) T FF.

30. Which type of ADC is fastest?

(A) SARC (B) Counter type

(C) Integrated type (D) Flash.

31. The resolution for a DAC is given by 0.4% then no. of bits of DAC is

(A) 8- bits (B) 12- bits (C) 16- bits (D) 32-bits.

32. CMRR of an OP AMP is given as 80dB and Ad is 20000.Value of A_{cm} will be

(A) 4 (B) 8 (C) 2 (D) 1.

33. Si and Ge lie in .....block of periodic table

(A) III (B) V (C) IV A (D) IV B.

34. VSWR = 1 is obtained when

(A) $Z_L = 0$ (B) $Z_L = \infty$ (C) $Z_L = Z_0$ (D) Z_L is reactive.

35. Half Power beam width of a dish antenna is

(A) $70\ \lambda/D$ (B) $70\ D/\lambda$ (C) $7\ D/\lambda$ (D) $7\ \lambda/D$.

36. One of the following types of noise becomes of great importance at high frequencies. It is the

(A) Shot Noise (B) Random Noise

(C) Impulse Noise (D) Transit-time Noise.

37. A Superheterodyne receiver with an IF of 450 kHz is tuned to a signal at 1200 kHz. The image frequency is

(A) 750 kHz (B) 900 kHz (C) 1650 kHz (D) 2100 kHz.

38. A receiver has poor RF selectivity. It will therefore also have poor

(A) Blocking (B) Double-Spotting

(C) Diversity reception (D) Sensitivity.

39. Indicate which of the following pulse modulation system is analog

(A) PCM (B) DPCM

(C) PWM (D) Delta Modulation.

40. The code which provides for parity check is

(A) Baudot (B) ASCII (C) EBCDIC (D) CCITT-2.

41. The data transmission rate of a modem is measured in

(A) bytes per second (B) baud rate

(C) bits per second (D) megahertz.

42. Satellites used for intercontinental communications are known as

(A) Comsat (B) Domsat (C) Marisat (D) Intelsat.

43. If the peak transmitted power in a radar system is increased by a factor of 16, the maximum range will be increased by a factor of

(A) 2 (B) 4 (C) 8 (D) 16.

44. Equalizing pulses in TV are sent during

(A) Horizontal blanking (B) Vertical blanking

(C) The Serrations (D) The Horizontal retrace.

45. A linear block code with a minimum distance d_{min} can correct up to ------ errors

(A) $t \leq floor[(d_{min}-1)/2]$ (B) $t \geq floor[(d_{min}-1)/2]$

(C) $t \leq floor[d_{min}/2 - 1]$ (D) $t \geq floor[d_{min}/2 - 1]$.

46. The mutual information of a channel may be expressed in terms of the entropy of the channel output as

(A) $I(x;y) = H(y) + H(y/x)$ (B) $I(x;y) = H(y) - H(x/y)$

(C) $I(x;y) = H(y) - H(y/x)$ (D) $I(x;y) = H(y) + H(x/y)$.

47. A network which compensates distortion is --------.

(A) Filter (B) Equalizer

(C) Attenuator (D) Amplifier.

48. The phase characteristic of a FIR filter is $\theta(\omega) = -5\omega$. The group delay of the filter is

(A) 5 (B) -5 (C) -10 (D) 10.

49. Z – Transform, evaluated on its unit circle is --------.

(A) DTFT (B) FT (C) IFT (D) FFT.

50. Calculate the critical frequency for reflection at vertical incidence if the maximum electron density is 1.24×10^6 cm^{-3}. That would be

(A) 5 MHz (B) 7 MHz (C) 10 MHz (D) 12 MHZ.

51. The maximum efficiency of a full-wave rectifier is ----------

(A) 40% (B) 81.2% (C) 40.2% (D) 90% .

52. Under normal operating voltages, the reverse current in a silicon diode isabout

(A) 1μA (B) 1mA (C) 10 μA (D) 100 μA.

53. The Potential at a point due to electric dipole consists of

(A) r terms (B) $1/r^2$ terms (C) $1/r^3$ terms (D) 1/r terms.

54. If a potential of 1V is applied across a capacitor of 10 pF, the energy stored is

(A) 5 PJ (B) 10 PJ (C) 100 PJ (D) 0.01 PJ.

55. The work in moving a charge between two points depends on

(A) the path (B) Q, E and the path

(C) Q and E only (D) Q, E and end points.

56. Q-Switched LASER is a

(A) Continuous Laser (B) Short burst Laser

(C) Laser produced by switching operation (D) Low powered Laser.

57. When a magnetic flux cuts across 200 turns at the rate of 2 wb/s, the induced voltage is

(A) 400 V (B) 100 V (C) 600 V (D) 0 V.

58. The Self-inductance of two coil are 4H and 9H. If the coefficient of coupling is 0.5, the mutual inductance between the two coil is

(A) 12 H (B) 3 H (C) 6 mH (D) 10 H.

59. A conductor 1 m long carries a current of 5 mA and is at an angle of 30° with B= 1.5 wb/m^2. The magnitude of the force is

(A) 7.5 mN (B) 5 mN (C) 3.75 mN (D) 7.5 N.

60. If a wave in free space has E = 2 V/m, H is

(A) 1/60 π A/m (B) 60 π A/m

(C) 120 π A/m (D) 240 π A/m.

61. If the dimension of the narrow and broad walls of a waveguide is 3 cm and 4.5 cm, the cut off wavelength for the dominant mode is

(A) 6 cm (B) 9 cm (C) 12.5 cm (D) 1.5 cm.

62. At low frequencies, earth is a

(A) Good Conductor (B) Excellent Conductor

(C) Bad Conductor (D) A Good Capacitor.

63. A solution to the "blind speed" problem is

(A) To change the Doppler Frequency (B) To vary the PRF

(C) To use monopulse (D) To use MTI.

64. The largest negative number can be represented with 8 bits in 2's compliment representation is

(A) -256 (B) -255 (C) -127 (D) -128.

65. Normalized frequency (V) for a single mode fiber is

(A) $V \leq 2.4$ (B) $2.4 \leq V \leq 3.8$ (C) $V \geq 2.4$ (D) $0 \leq V \leq 3.8$.

66. If BW is the bandwidth of an optical fiber and NA is the numerical aperture then

(A) BW α NA (B) BW α 1/ NA (C) BW α 1/(NA)^2 (D) BW α 1/(NA)^3

67. Scattering loss in optical fiber varies with wavelength as

(A) $1/\lambda$ (B) $1/\lambda^2$ (C) $1/\lambda^4$ (D) $1/\lambda^3$.

68. -23 dBm indicates a power of

(A) 23 mW (B) 5 μW (C) -23 mW (D) 10 mW.

69. If bandgap energy of a material is 1.24 eV then wavelength of peak emission is

(A) 1.0 μm (B) 0.75 μm (C) 1.24 μm (D) 124 μm.

70. The material used for optical fiber for least losses is

(A) SiF_4 (B) NaF_4 (C) ZrF_4 (D) $NaSiF_4$.

71. Photo Detector is a

(A) Triangular device (B) Square Law device

(C) Linear device (D) Linear Component.

72. The information content of a message with occurrence probability 1/8 is

(A) 1/8 bits (B) 8 bits (C) 1/4 bits (D) 3 bits.

73. In the hierarchy of SONET, OC-12 data rate corresponds to

(A) 622 Mbps (B) 622.08 Mbps (C) 466.56 Mbps (D) 466 Mbps.

74. If the closed loop transfer function of a system is $1/(s^2 + a^2)^2$ then the system is

(A) Stable (B) Unstable

(C) Conditionally Stable (D) Marginally Stable.

75. Find the Z transform of $\delta(n)$

(A) 1 (B) 0 (C) ∞ (D) -1.

76. Given $h(t)= e^{-t} u(t)$. Find H(s)

(A) 1/s (B) 1/(s+1) (C) 1/(s-1) (D) $1/(s-1)^{-1}$.

77. The TCP/IP protocol architecture is a result of protocol research and development conducted on _____ network.

(A) Circuit Switched (B) Burst Switched

(C) Packet Switched (D) None of the above.

78. E_b/N_0 is related to SNR, select the correct one from the following.

(A) $E_b/N_0 = E_s/N_0$ (B) $E_b/N_0 = N_0/SNR$

(C) $E_b/N_0 = 1/(N_0.SNR)$ (D) $E_b/N_0 = SNR/ N_0$.

79. What type of approach is used in DECT?

(A) TDD (B) FDD (C) WDM (D) OFDM.

80. The gain of an isotropic antenna is

(A) 3 dB (B) 10 dB (C) 1 dB (D) 0 dB.

81. For a short circuited and open circuited line if their impedances are 5 ohm and 20 ohm, then characteristic impedance is

(A) 4 ohm (B) 100 ohm (C) 10 ohm (D) 25 ohm.

82. In order to properly reverse bias the collector base junction of silicon transistor, minimum V_{CE} required is

(A) 0.3 V (B) 1 V (C) 0.5 V (D) 0.8V.

83. B is said to be linear if

(A) B and H are parallel (B) B and H are perpendicular

(C) E and H are parallel (D) E and H are perpendicular.

84. When the both junction of NPN diode is reverse biased, then the diode is in which mode

(A) Active (B) Cutoff (C) Saturation (D) inverted.

85. If the voltage or current from the receiving end towards the sending end is decreasing in amplitude with increasing distance from the load then it is called

(A) Incident wave (B) Medium wave

(C) Reflected wave (D) None of above.

86. Three bulbs of 60 watts each are connected in parallel across 220v, 50 Hz supply. If one bulb burns out

(A) Only remaining two will operate

(B) Remaining two will not operate

(C) All of three will operate

(D) There will be heavy current from the supply.

87. Two 16:1 and one 2:1 multiplexers can be connected to form a

(A) 64:1 multiplexer (B) 32:1multiplexer

(C) 16:1 multiplexer (D) 8:1 multiplexer.

88. A system with gain margin close to unity or a phase margin close to zero is

(A) Highly stable (B) Highly oscillatory

(C) Relatively stable (D) None of the above .

89. Human system can be considered as

(A) Open loop system

(B) Closed loop system with single feedback

(C) Closed loop system with multivariable feedback

(D) None of these.

90. A system has the transfer function (1-s)/(1+s); It is known as

(A) Low pass system (B) All pass system

(C) High pass system (D) None of the above.

91. In a single stage transistor amplifier, if input signal is 1 mV (rms), R_{AC} = 2 K ohm, R_{in} = 1 K ohm and Beta = 50, then output voltage is

(A) 25 mV (B) 50 mV (C) 75 mV (D) 100 mV.

92. If three stage amplifier has individual stage gain of 10 dB, 5 dB and 12 dB, then the total gain is

(A) 12 dB (B) 600 dB (C) 27 dB (D) 17 dB.

93. A power supply has a voltage regulation of 1%. If the no load voltage is 30 V, then the full load voltage is

(A) 30 V (B) 29.7 V (C) 30.3 V (D) 45 V.

94. If the input to a differentiating circuit is a saw-tooth wave, then output will be

(A) Saw-tooth wave (B) Square wave

(C) Rectangular wave (D) Triangular wave.

95. When V_{GS} of a FET changes from -3.1 V to -3 V, the drain current changes from 1 mA to 1.3 mA, then the value of transconductance is

(A) 30 micro mhos (B) 30 m A/V (C) 3 micro mhos (D) 3 m A/V .

96. A unijunction transistor has 10 V between the bases. If the intrinsic stand off ratio is 0.65, then the value of stand off voltage is

(A) 6.5 V (B) 0.065 V (C) 10.65 V (D) 9.35 V.

97. What is the ratio of modulating power to total power at 100% modulation?

(A) 1 : 3 (B) 1 : 2 (C) 2 : 3 (D) 1 : 1.

98. An FM signal with a modulation index m_f is passed through a frequency tripler. The wave in the output of the tripler will have a modulation index of

(A) $m_f/3$ (B) m_f (C) $3\,m_f$ (D) $9\,m_f$.

99. How many NAND gates are needed to realize OR gate?

(A) 1 (B) 2 (C) 3 (D) 4 .

100. If the signal level is 1 mW, power gain is

(A) 0 dBm (B) 1 dBm (C) 0.01 dBm (D) 10 dBm.