

ENTRANCE EXAMINATION FOR ADMISSION, MAY 2010.
Ph.D. (ELECTRONICS AND COMMUNICATION ENGINEERING)

COURSE CODE : 138

Register Number :

*Signature of the Invigilator
(with date)*

COURSE CODE : 138

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. Semiconductors are those which have
 - (A) no physical distinction between the two bands
 - (B) an empty conduction band and a filled valence band
 - (C) current due to electrons only
 - (D) current due to holes only

2. Input resistance of an ideal voltage and current amplifier is
 - (A) 0, 0
 - (B) 0, infinity
 - (C) Infinity, 0
 - (D) Infinity, infinity

3. The high frequency response of an amplifier is determined by its
 - (A) Hybrid π model
 - (B) Hybrid T model
 - (C) Cascade model
 - (D) Eber Moll's model

4. Q factor of an inductor is given by
 - (A) ωL
 - (B) $\omega L/R$
 - (C) $\omega^2 LR$
 - (D) ωLR

5. Avalanche breakdown occurs when
 - (A) forward current becomes excessive
 - (B) the potential barrier is reduced to zero
 - (C) forward bias exceeds a certain value
 - (D) reverse bias exceeds a certain value

6. If the dc value of a rectified output is 300 V and peak to peak ripple value is 10 V, the ripple factor is
 - (A) 1.18%
 - (B) 3%
 - (C) 40.6%
 - (D) 90%

7. A PN PN device having no gate is called
 - (A) UJT
 - (B) Free wheeling diode
 - (C) Rectifying diode
 - (D) Shockley diode

8. The Kirchoff's law fails in
 - (A) Linear circuits
 - (B) Nonlinear circuits
 - (C) Dual circuits
 - (D) Distributed parameter circuits

9. Condition of reciprocity of network
 - (A) $y_{11} = y_{22}$
 - (B) $Z_{12} = Z_{21}$
 - (C) $A = D$
 - (D) $h_{12} = h_{21}$

10. Transformer coupling in transistor amplifier circuits provides high efficiency because
 (A) flux linkages are incomplete (B) collector voltage is stepped down
 (C) collector voltages is stepped up (D) dc resistance is low
11. When an opamp is operated in common mode fashion, its CMRR should be
 (A) Zero (B) 10 db (C) Infinity (D) 20 db
12. The gain of inverting amplifier is _____ than that of non-inverting amplifier using identical op-amps.
 (A) slightly lesser (B) greater (C) equal to (D) 10 times
13. Solar cell is basically a
 (A) Photometer (B) Photoemissive cell
 (C) Photoconductive cell (D) Photovoltaic cell
14. In Gunn diode, negative resistance is obtained because of
 (A) Avalanche breakdown with high voltage gradient
 (B) Electrons domains are formed at the junction
 (C) Electron transfer to a less mobile energy level
 (D) Tunneling effect across the junction
15. The tunnel diode
 (A) has a tiny hole for tunneling
 (B) has a point contact with high reverse resistance
 (C) uses a high doping level to provide a narrow junction
 (D) uses an alloyed junction for tunneling
16. A parametric amplifier has an input and output frequency of 2.5 GHz, it is pumped at 5GHz. It is a
 (A) Backward amplifier (B) Degenerate amplifier
 (C) Doubler amplifier (D) Travelling wave amplifier
17. Light emitting diodes fabricated from Ga As emit radiation in the region of
 (A) Green (B) Infra red (C) Ultra violet (D) Visible
18. Temperature coefficient of resistance of sensor is
 (A) Negative (B) Positive (C) Zero (D) Large

19. Capacitors for ICs can be fabricated using
 (A) Isolation process (B) Integrators
 (C) Masks (D) SiO₂ as dielectric
20. Laplace transform of Cos ωt is
 (A) $\omega/(s^2 + \omega^2)$ (B) $s/(s^2 + \omega^2)$ (C) $\omega^2/(s^2 + \omega^2)$ (D) $s^2/(s^2 + \omega^2)$
21. In the Fourier series expansion of an even function there are
 (A) sine terms only (B) cosine terms only
 (C) both sine and cosine terms (D) neither sine and cosine terms
22. Z transform of a step input function is
 (A) 1 (B) $Z/(Z-1)$ (C) $Z / (Z-1)^2$ (D) $Z(Z-1)^2$
23. For a decade counter, number of RS flipflops to be used in cascade are
 (A) 10 (B) 2 (C) 4 (D) 5
24. In a RS flip flop no change in state will occur due to _____ input.
 (A) 0 - 1 (B) 1 - 0 (C) 0 - 0 (D) 1 - 1
25. Emitter coupled logic exhibits fastest switching speed because the gates use
 (A) Saturated transistors (B) Saturated diodes
 (C) Thyristor (D) Unsaturated transistors
26. A computer having 4K memory means _____ storage locations.
 (A) 4 (B) 400 (C) 4096 (D) 4×2^8
27. Demorgan's theorem can be expanded to three variables as
 (A) $(X+Y+Z)' = (XY)' + (YZ)' + (ZX)'$ (B) $(X+Y+Z)' = X' + Y' + Z'$
 (C) $(X+Y+Z)' = XYZ$ (D) $(X+Y+Z)' = X' Y' Z'$
28. The three variable Boolean expression $f = \Sigma 0, 1, 3, 4$ means
 (A) $A'B'C' + ABC' + ABC$ (B) $A'B'C' + A'BC' + A'BC + ABC$
 (C) $A'BC' + AB'C' + ABC + A'BC$ (D) $A'B'C' + A'B'C + A'BC + ABC$

29. Binary 1100101 is equivalent to _____ in Gray code.
(A) 1100101 (B) 1010011 (C) 0010111 (D) 0100101
30. In a four input NAND gate all inputs are 1 the output is
(A) 4 (B) 1/4 (C) 1 (D) 0
31. An exclusive OR gate can be realized by using
(A) 2 OR gates (B) 2 NOT gates and one OR gate
(C) 4 NAND gates and one NOR gate (D) 5 NAND gates
32. An example of a combinational circuit is
(A) Counters (B) Shift registers
(C) Full adder (D) Flip flop
33. In Moore sequential machine the output is a function of
(A) all the inputs
(B) all the present states
(C) all possible combinations of input and present states
(D) a few combination of inputs and present state
34. The ROM consists of
(A) a multiplexer followed by a decoder (B) a demultiplexer
(C) a multiplexer (D) a decoder followed by an encoder
35. Shift of a register by one bit to the left is equivalent to _____ by 2.
(A) Addition (B) Subtraction
(C) Multiplication (D) Division
36. For a four input resistance divider having $0 = 0 \text{ V}$, $1 = +15 \text{ V}$ the analog output voltage for a digital input of 1101 is
(A) 1.5 V (B) 5 V (C) $11\frac{1}{4} \text{ V}$ (D) 13 V
37. Least propagation delay is exhibited by
(A) ECL (B) HTL (C) TTL (D) RTL

38. The function of two parallel switches is similar to logic gate which is
 (A) AND (B) NAND (C) NOR (D) OR
39. Pick out the invalid relation according to Boolean algebra
 (A) $X+X' = 1$ (B) $X.X = X$ (C) $1.X = 1$ (D) $0.X = 0$
40. The Boolean expression $XY(X'YZ + XY'Z + X'Y'Z')$ will be simplified as
 (A) 1 (B) 0 (C) X (D) X'
41. The complement of $(X + YZ + XY)$ will be
 (A) $XY'Z'$ (B) $X'Y'Z'$ (C) $X'(Y+Z')$ (D) $X(Y'+Z')$
42. Family of 7400 series of digital IC is
 (A) CMOS (B) DTL (C) ECL (D) TTL
43. The electrical conductivity σ is related to mobility μ by
 (A) $\sigma = n\mu$ (B) $\sigma = ne\mu$ (C) $\sigma = e\mu$ (D) $\sigma = \frac{1}{2} ne^2\mu$
44. De Broglie wavelength λ of an electron relates to Plank's constant h and mass of electron m as
 (A) $\lambda = hmv$ (B) $\lambda = h / mv$ (C) $\lambda = h / m$ (D) $\lambda = 2\pi / hm$
45. The conductivity of a conductor can be increased by
 (A) increasing its temperature
 (B) decreasing its temperature
 (C) increasing its vibrations
 (D) decreasing its temperature and vibrations
46. The value of e/m of an electron is
 (A) 1.758×10^{11} C/Kg (B) 1.601×10^{-9} C/Kg
 (C) 3.62×10^{-11} C/Kg (D) 5.613×10^9 C/Kg
47. The relative permittivity of silica is
 (A) 1.006 (B) 4.5 (C) 8.1 (D) 3.8

48. Dipole moment per unit volume is called
 (A) Electric flux density (B) Magnetic flux density
 (C) Charge density (D) Polarization
49. The relative permeability of a medium μ_r is related to its own permeability of free space μ_0 as
 (A) $\mu_r = \mu/\mu_0$ (B) $\mu_r = \mu \mu_0$ (C) $\mu_r \mu_0 = \mu$ (D) $\mu = \mu_r / \mu_0$
50. A sphere of 10 m encloses a charge of 1000 coulombs the displacement density is given in c / m^2 by
 (A) 100 (B) 10,000 (C) 0.834 (D) 1.667
51. Select the equation which is not Maxwell
 (A) $D = \epsilon E$ (B) $E = \epsilon D$ (C) $J = \sigma E$ (D) $B = \mu H$
52. For normal incidence the angle of incidence is
 (A) 90 (B) 180 (C) 0 (D) 45
53. When a wave is incident from a more dense into a less dense medium at an angle equal to or exceeding the critical angle, the wave will have
 (A) Total internal refraction (B) Total interval transmission
 (C) Total internal reflection (D) Surface wave
54. The phase velocity of a transmission line in terms of its R, L, C and G parameters is
 (A) $V = L/R$ (B) $V = 1/LC$
 (C) $V = 1/(LC)^{1/2}$ (D) $V = GC/RL$
55. VSWR of a transmission line is defined as
 (A) V_{\max} / V_{\min} (B) V_{\min} / V_{\max}
 (C) $V_{\max} \cdot V_{\min}$ (D) $1 / (V_{\max} \cdot V_{\min})$
56. For a reflection coefficient of 0.5 the value of SWR is
 (A) 0.5 (B) 0 (C) 1 (D) 3
57. A line of characteristic impedance 100 ohm is terminated by a 100 ohm impedance. The input impedance will be
 (A) Zero (B) 10 ohm (C) 50 ohm (D) 100 ohm

58. The directive gain in a given direction is the ratio of
- (A) Radiation intensity in that direction to the total input radiated power
 - (B) Average power to maximum power
 - (C) R.M.S. power to peak power
 - (D) Radiation intensity in that direction to the average power radiated.
59. One among the following is a non resonant antenna
- (A) Rhombic antenna
 - (B) Yagi antenna
 - (C) Adcock antenna
 - (D) Log periodic antenna
60. An antenna that is circularly polarized is
- (A) Parabolic reflector
 - (B) Small circular loop
 - (C) Helical
 - (D) Yagi uda
61. When microwave signals follow the curvature of the earth, this is known as
- (A) Faraday effect
 - (B) Ducting
 - (C) Ground wave
 - (D) Troposcatter
62. The radiation resistance of a folded dipole antenna is
- (A) 292 ohms
 - (B) 73 ohms
 - (C) 146 ohms
 - (D) 50 ohms
63. In a communication system, noise is most likely to affect the signal
- (A) at the transmitter
 - (B) in the channel
 - (C) in the information source
 - (D) in the receiver
64. The advantage of AM over FM is
- (A) SNR is small
 - (B) Lower bandwidth requirement
 - (C) Less modulating power
 - (D) More useful transmitted power
65. The advantage of DSB over SSB full carrier AM is
- (A) less available channel space
 - (B) signal is less resistant to noise
 - (C) more stable transmitter circuit gives better reception
 - (D) more power to transmit same signal.

66. The frequency deviation in a FM transmitter having modulation index 6 is 60 KHz, its bandwidth is
(A) 60 KHz (B) 360 KHz (C) 10 KHz (D) 140 KHz
67. The term neutralization refers to
(A) Inhibiting spurious oscillations
(B) Stabilizing the frequency of an oscillator
(C) Modulating at very low levels
(D) Tuning an antenna for maximum gain
68. The Hartley law states that
(A) the maximum rate of information transmission depends on the depth of modulation
(B) the maximum rate of information depends on the channel bandwidth
(C) only binary codes may be used
(D) redundancy is essential
69. 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) $m_f / 9$ (B) $m_f / 3$ (C) m_f (D) $3 m_f$
70. In the spectrum of a FM wave
(A) the carrier frequency disappears when the modulation index is large
(B) the amplitude of any side band depends upon the modulation index
(C) the total number of sidebands depends upon the modulation index
(D) the carrier frequency cannot disappear
71. Pulse width modulation may be generated
(A) by differentiating a PPM signal (B) by a monostable multivibrator
(C) by integrating a PPM signal (D) by a bistable multivibrator
72. Quantizing noise occurs in
(A) TDM (B) FDM (C) PWM (D) PCM

73. Companding is used
- (A) in delta modulator to combat noise
 - (B) to protect small signals in PCM from quantizing distortion
 - (C) in PWM for working it with TDM
 - (D) in PCM to reduce SNR
74. In superheterodyne receivers, the signal voltage is combined with local oscillator in a mixer and converted to a lower fixed frequency which is amplified and detected to produce the original information. This fixed frequency is called as
- (A) Internal frequency
 - (B) Intermediate frequency
 - (C) International frequency
 - (D) Image frequency
75. A scheme in which several channels are interleaved and then transmitted together is known as
- (A) group
 - (B) subgroup
 - (C) super group
 - (D) multiplexing
76. A sequence of symbols which are dependent upon one another is called
- (A) D-entropy
 - (B) D-bit
 - (C) Redundancy
 - (D) Reliability
77. Hartley Shannon law is expressed in bits per second as
- (A) $C = W(1 + \text{SNR})$
 - (B) $C = W / (1 + \text{SNR})$
 - (C) $C = W \log(1 + \text{SNR})$
 - (D) $C = W / \log(1 + \text{SNR})$
78. The entropy for tossing a coin is _____ bit/message.
- (A) 2
 - (B) $\frac{1}{2}$
 - (C) 0
 - (D) 1
79. Coherent detection employs _____ of carrier envelope.
- (A) Amplitude
 - (B) Phase
 - (C) Phase and frequency
 - (D) Amplitude and frequency
80. If it takes the transmitted signal 2 m sec to go to the target and come back after reflection the target is at a distance of _____ kilometres from the radar.
- (A) 30
 - (B) 100
 - (C) 150
 - (D) 300
81. A wave guide is a _____ filter.
- (A) mechanical
 - (B) band pass
 - (C) low pass
 - (D) high pass

82. A Klystron a cavity acting as a buncher and catcher works on the principle of
 (A) Velocity modulation (B) Frequency modulation
 (C) Guiding waves (D) Impedance transformation
83. The range of X band is
 (A) 1-2 GHz (B) 2-4 GHz (C) 4-8 GHz (D) 8-12 GHz
84. The modulation technique used in GSM system is
 (A) FSK (B) BPSK (C) QPSK (D) GMSK
85. The _____ layer is concerned with local delivery of frames between devices on the same LAN.
 (A) Data link (B) Transport (C) Network (D) Physical
86. Noise figure is related to noise factor as
 (A) $NF = \log_e F$ (B) $NF = \log_{10} F$
 (C) $NF = 10 \log_{10} F$ (D) $NF = 20 \log_{10} F$
87. When through the occurrence of event A, the event B cannot take place and vice versa, the events A and B are said to be
 (A) Exclusive (B) Independent
 (C) Mutual (D) Mutually exclusive
88. In a Delta Modulation the granular noise occurs when the modulating signal
 (A) decreases rapidly (B) increases rapidly
 (C) remains constant (D) remains idle
89. A 10 GHz signal was beamed up at a geostationary satellite at a distance of 36000 km from the signal undergoes a free space loss of
 (A) 10 db (B) 20 db (C) 200 db (D) 365 db
90. For frequency f and distance D , the free space attenuation of a RF signal is equal to
 (A) $20 \log_{10} (D / f)$ (B) $20 \log_{10} D + 20 \log_{10} f$
 (C) $32.5 \log_{10} (D f)$ (D) $32.5 \log_{10} D + 20 \log_{10} f$
91. Sound travels faster in
 (A) Air (B) Aluminium (C) Vacuum (D) Water

92. If the absolute power ratio is 10,000, the power gain in db is
(A) 4 db (B) 1 db (C) 10 db (D) 40 db
93. For an electronic device operating at temperature of 17 C and bandwidth 10 KHz. Determine the thermal noise.
(A) 4×10^{-17} watts (B) 3×10^{-16} watts
(C) 5×10^{-15} watts (D) 1×10^{-14} watts
94. _____ is a process by which different information sources are propagated on an optical fibre by modulating lasers at different wavelengths.
(A) TDM (B) FDM (C) WDM (D) SDM
95. The most commonly used ISM band refers to the frequency range
(A) 1.2 – 2.2 GHz (B) 2.4 – 2.5 GHz (C) 5 – 6 MHz (D) 10 – 12 MHz
96. _____ is the characteristic impedance of free space.
(A) 478 ohms (B) 377 ohms (C) 50 ohms (D) 75 ohms
97. What is the line speed of a PCM system for voice transmission?
(A) 8 Kbps (B) 32 Kbps (C) 64 Kbps (D) 128 Kbps
98. A _____ is a make before break process in mobile communication.
(A) hard handoff (B) soft handoff
(C) strict handover (D) turbo handover
99. SDH is the name of
(A) Wireless standard (B) LAN standard
(C) Optical network standard (D) Microwave standard
100. UMTS employs _____ as the air interface.
(A) FDMA (B) TDMA
(C) CDMA (D) Wideband CDMA