Deputy Executive Information Engineers in A.P. Information Service-

NOTIFICATION NO: 29/2018 (GENERAL RECRUITMENT)

INITIAL KEY

1. An open circuited coil has______________.

   Infinite resistance and zero inductance

2. An RC network has a capacitor C = 2μF in series with a resistor R= 1MΩ. The time of 6 seconds will be equal to___________.

   three time constants

3. In a RLC series resonant circuit at the half power points________________.

   The resistance equal to the resultant reactance

4. A two port network is reciprocal if and only if

   BC-AD = -1

5. A step function voltage is applied to a RLC series circuit having R = 1Ω, L = 1H, and C = 1F. The transient current response of the circuit would be________________.

   under damped

6. A two terminal black box contains an element which can be R, L, C and M. As soon as the black box is connected to a DC voltage source, a finite non zero current is observed to flow through the element. The element is____________.

   a resistor

7. The transfer function of an electrical lowpass RC network is_____________.

   $$\mathbf{\frac{1}{1+ \mathit{RCs}}}$$

8. The DC gain of a system represented by the transfer function $\frac{5}{(s+2)(s+3)}$ is________.

   5/6

9. A capacitor of 0.1F has a leakage resistance of 100kΩ across its terminals. Its quality factor at 10 rad/sec is_________________.

10^5

10. The system is represented by the difference equation $\ddot{y}+5\dot{y}+6y=u$. The state vector matrices A, B, C, D are

$$\boldsymbol{A}=\begin{bmatrix} \mathbf{0} & \mathbf{1} \\ -6 & -5 \end{bmatrix}, \boldsymbol{B}=\begin{bmatrix} \mathbf{0} \\ 1 \end{bmatrix}, \boldsymbol{C}=\begin{bmatrix} \mathbf{1} & \mathbf{0} \end{bmatrix}, \boldsymbol{D}=[\mathbf{0}]$$

11. The output of the integral function $\int_{-1}^{1}(3t^2+1)\delta(t)dt$ is

1

12. A system has the input – output relation given by $y(t)=T[x(t)]=x^2(t)$, The system is _________________.

Non-linear, Time invariant

13. The impulse responses of the systems are given by $h_1(t)=e^{-2t}u(t)$ and $h(t)=2e^{-t}u(t)$. These two systems $h_1(t)$ and $h_2(t)$ are connected in cascade. The impulse response of the overall system is ________________.

$$\mathbf{2}(\boldsymbol{e}^{-t}-\boldsymbol{e}^{-2t})\boldsymbol{u}(\boldsymbol{t})$$

14. The Z-Transform of $x[n]=-a^n u[-n-1]$ is______________.

$$\frac{\boldsymbol{z}}{\boldsymbol{z}-\boldsymbol{a}}$$

15. The inverse Z transform of $X(z)=\log\left(\frac{1}{1-a^{-1}z}\right), |z|<|a|$, _____________________.

$$-\frac{1}{n}a^n u[-n-1]$$

16. Fourier series coefficient of the signal$(t) = \cos 4\pi t + \sin 6\pi t$

is_______________.

$$a_{\pm 3} = \pm\frac{1}{2j},\ a_{\pm 2} = \pm\frac{1}{2}$$

17. The DFT of $x^*[n]$ is_______________________________.

$$X^*[-k]_{\text{mod } N}$$

18. Consider a discrete time LTI system described by $y[n] - \frac{1}{2}y[n-1] = x[n] + \frac{1}{2}x[n-1]$. The frequency response $H(e^{j\omega})$ of the system is_________________.

$$\frac{1+\frac{1}{2}e^{-j\omega}}{1-\frac{1}{2}e^{-j\omega}}$$

19. If the Nyquist rate for $x_a(t)$ is Ω_s. The Nyquist rate for dt is__________.

$$\Omega_s$$

20. How many complex multiplications are necessary in a radix 3 decimation in frequency FFT computation?

$$2N\log_3 N$$

21. A Si sample is doped with 10^{17} As atoms/cm^3. The equilibrium hole concentration at 300K is _______________.$(n_i = 1.5 \times 10^{10} cm^{-3})$

2.25 x 10^3 cm^{-3}

22. Consider two Si PN junction diodes, one long and one short (contacts within a diffusion length of the depletion region) but otherwise identical. Under identical forward bias voltage, which diode would have greater current flow?

Short

23. The___________is (desirably) high for voltage controlled field effect transistors and low for current controlled bipolar junction transistors.

Input Impedance

24. While increasing the device temperature, the subthreshold source to drain leakage current of MOSFET will be_________________.

Increased

25. The resistivity of the P region and N region of a Germanium diode are 6Ω-cm and 4Ω-cm respectively. The contact potential and the potential energy barrier are___________and________. (The given details are $q = 1.6 \times 10^{-19}$C, $n_i = 2.5 \times 10^{13}/cm^3$, $\mu_p = 1800\ cm^2/V\text{-}s$, $\mu_n = 3800\ cm^2/V\text{-}s$, and $V_T = 0.026V$ at 300^oK).

0.1545V, 0.1545eV

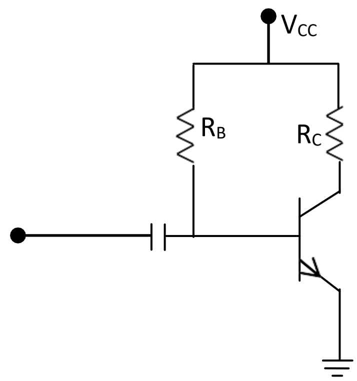
26. If a bipolar junction transistor has β = 100 and the collector current is 40mA. The emitter current is _________________.

40.4mA

27. The reverse leakage current of the transistor when connected in common base (CB) configuration is 0.2μA and it is 20μA when the same transistor is connected in common emitter (CE) configuration. The large signal dc current gain of the transistor in CE configuration is_________. (Assume I_B = 30mA)

99

28. What is the value of R_B and R_C in the circuit given below? The data as follows: I_{CQ} = 1mA, V_{CEQ} = 16V, Vcc = 10V, V_{BE}(ON) = 0.7 V and β = 100.



0.93MΩ, 4kΩ

29. The stability factor is defined as

a. The rate of change of the I_C with respect to I_{CO}, keeping I_B and β constant

30. An N channel JFET has I_{DSS} = 8mA, and V_P = -5V. The $V_{DS(min)}$ and I_{DS} are________________and _______________for V_{GS} = -2V in the pinch off region.

3V, 2.88mA

31. For reverse biased PN junction, the current through the junction increases abruptly at ________

Breakdown voltage

32. The LED light is emitted because

recombination of charge carriers take place

33. Find the correct match between Group A and Group B

Group A	Group B
(i) Varactor diode	(a) Voltage reference
(ii) PIN diode	(b) High frequency switch

(iii) Zener diode (c) Tuned circuit

(iv) Schottky diode (d) current controlled attenuator

(i) – c, (ii) – d, (iii) – a, (iv) – b

34. Match items in Group A with items Group B, most suitably

	Group A	Group B
(i)	LED	(a) Heavily doping
(ii)	Avalanche diode	(b) coherent radiation
(iii)	Tunnel diode	(c) spontaneous emission
(iv)	LASER	(d) current gain

(i) – c, (ii) – d, (iii) – a, (iv) – b

35. The process is to arrange the atom in single crystal fashion upon a single crystal substrate is _____________.

Epitaxial growth

36. Films with thickness greater than $100\mu m$ are usually made by____________technology.

Thick

37. Buried layer is a heavily doped n^+ layer sandwiched between the P type substrate and N type epitaxial collector to___________________the collector series resistance of the IC transistor.

reduce

38. Arrange the basic processes in order to use in the silicon planar technology.

Substrate preparation, epitaxial growth, SiO_2 growth, photolithography, diffusion, metallization

39. The film technology provides greater precision in manufacturer is______________.

thin

40. Voltage divider bias__________________.

Can be essentially independent of β_{DC}

41. Ideally, a dc load line is a straight line drawn on the collector characteristic curves between

the V_{CE}(cut off), and I_C(sat)

42. A MOSFET differs from a JFET mainly because

the JFET has a PN junction

43. A certain D-MOSFET is biased at V_{GS} = 0V. Its data sheet specifies I_{DSS} = 20mA and V_{GS}(off) = -5V. the value of the drain current is____________________.

20mA

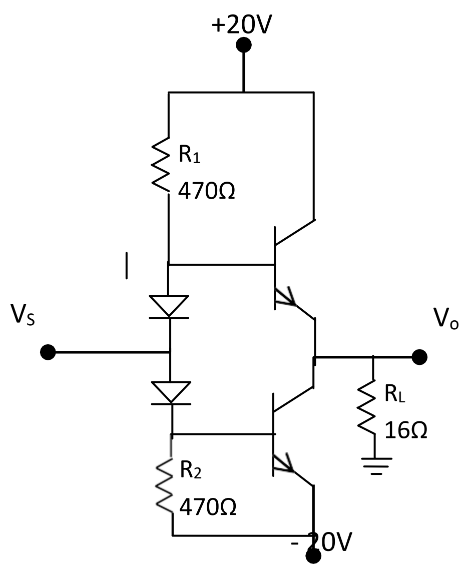
44. In a certain FET circuit, V_{GS} =0V, V_{DD} = 15V, I_{DSS} = 15mA, and R_D = 470Ω. If R_D is decreased 330Ω, I_{DSS} is____________________.

15mA

45. A class C amplifier is driven by a 200kHz signal. The transistor is on for 1μs and the amplifier is operating over 100% of its load line. If I_C(sat) = 100mA and V_{CE}(sat) = 0.2V. The average power dissipation is______________.

4mW

46. The ideal maximum peak output voltage and current for the circuit shown below is ___________ and________________.



20V, 1.25A

47. A class A power amplifier delivers 5W to a load with an input signal power of 100mW. The power gain is______________________.

50

48. Both stages in a certain 2 stage amplifier have a lower critical frequency of 500Hz and an upper critical frequency of 80kHz. The overall bandwidth is_________________.

50.7kHz

49. A series regulator has an output voltage of 9V. If the opamp's closed loop gain is 3, what is the value of the reference voltage?

3V

50. A regulator has a no load output voltage of 10V and a full load output voltage of 9.9v. The percent of load regulation is______________________.

1.01

51. An inverting amplifier has a closed loop gain of 25. The opamp has an open loop gain of 10^5. If another opamp with an open loop gain of $2x10^5$ is substituted in the configuration, the closed loop gain___________________.

remains at 25

52. Which statement is wrong for ideal characteristics of opamp____________.

Slew rate is zero

53. What is the breakdown voltage of the precision diode made up of silicon material?

$0.7V/A_{OL}$

54. The Notch filter is a______________________.

filter to eliminate a single frequency in the input signal

55. How many opamp based voltage comparators are used in 555 timer IC?

2

56. In 555 timer astable mode operation, the fundamental frequency of the output waveform is________.

(1) $\boldsymbol{T = 0.693(R_A + 2R_B)C}$

57. A lowpass Butterworth filter to band pass Butterworth filter transformation function will be _____________.

$$s \rightarrow \frac{s^2 + \omega_0^2}{(\omega_h - \omega_l)s}$$

58. An amplifier has a power gain of 23dB. If the input is 1mW, what is the output?

199.5mW

59. The advantage of linear regulator is

accuracy of control

60. The switching regulator has_________________efficiency

high

61. Which statement is wrong for the general rules that should be considered when using heat sinks?

Give excessive torque on the mounting hardware

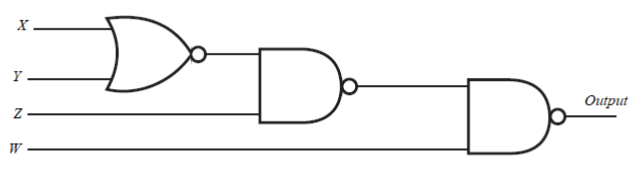
62. How might square wave be generated from a triangular source?

Pass the output of the triangular wave generator into a comparator

63. Binary equivalent of gray code number 10110101 is_________________.

11011001

64. The Boolean expression of the figure shown below is__________________.



$\overline{X}\overline{Y}.Z + \overline{W}$

65. The Consensus theorem says that_____________________________.

$$XY + \overline{X}Z + YZ = XY + \overline{X}Z$$

66. Given that IC7483 is a 4 bit parallel adder chip, how do you build a 16 bit parallel adder circuit?

by a cascaded arrangement of 4 IC7483s

67. Identify the incorrect statement

D flip flop is same as D latch

68. An 8 bit binary ripple up counter with a modulus of 256 is holding the count 01111111.what will be the count after 135 clock pulses?

00000110

69. A binary ripple counter is capable of counting the number of items passing on a conveyer belt. Each time an item passes a given point, a pulse is generated that can be used to as a clock input. If the maximum number of items to be counted is 8000,_____________number of flip flops required.

13

70. A 4 bit ring counter is in turn clocked by a 10MHz clock signal. The frequency and duty cycle of the output flip flop are________________and________________.

2.5MHz, 25%

71. A 100 stage serial in serial out shift register is clocked at 100kHz. How long will be the data be delayed in passing through this register?

1ms

72. Minterm and Maxterm Boolean functions of $f(A,B,C)=\prod(0,3,7)$ is ___________________, ________________________.

$A\overline{B}+\overline{B}C+B\overline{C},(A+B+C)(\overline{B}+\overline{C})$

73. A dynamic RAM consists of_______

1 transistor and 1 capacitor

74. The access time of ROM using bipolar transistor is about_______________.

1µsec

75. Which is known as flash converter_____________.

parallel ADC

76. A 10 bit DAC given a maximum output of 10.23V. The resolution is

(1**) 10mV**

77. An 8 bit successive approximation ADC has full scale reading of 2.55V and its conversion time for an analog input of 1V is 20µs. the conversion time for a 2V input will be

20µs

78. A 6 bit ladder DAC has input 101001. For 1=10V and 0 = 0V, the output is

6.51

79. In an 8085 microprocessor, the shift registers which store the result of an addition and the overflow bit are respectively.

A and F

80. In an 8085 microprocessor, which one of the following instructions changes the content of the accumulator?

SBI BEH

81. A transfer function has two zeros at infinity. Then the relation between the numerator degree (M) and the denominator degree (N) of the transfer function is

(**M = N-2**

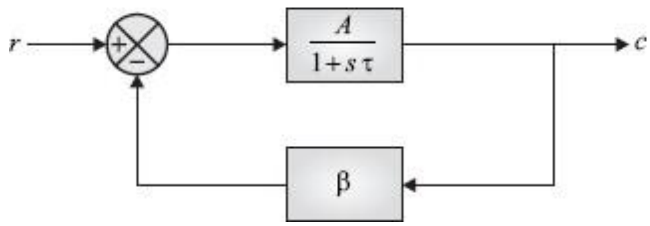
82. The differential equation of the SISO system is given by $\frac{d^2y}{dt^2} + 1\frac{dy}{dt} + 10y = 5\frac{du}{dt} - 3u$, where y denotes output and u represents input. For an input $u(t)$ with zero initial conditions the above system produces the same output as with no input and with initial conditions $y'(0-) = -4,\ y(0-) = 1$. Input $u(t)$

$$\frac{1}{5}\delta(t) - \frac{7}{25}e^{\left(3/5\right)t}u(t)$$

83. A control system is defined by the following differential equation $\frac{d^2x}{dt^2} + 6\frac{dx}{dt} + 10x = 12\left(1 - e^{-2t}\right)$. The response of the system as $t \to \infty$ is

***x*=2.4**

84. In the feedback system shown in figure below, the time constant of the closed loop system will be

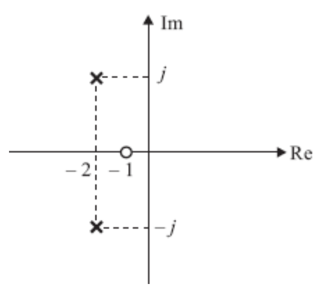


$$\boldsymbol{\frac{\tau}{1 + A\beta}}$$

85. Despite the presence of negative feedback control system still have problems of instability because the

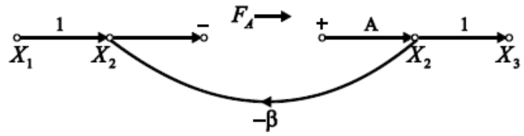
components used have non-linearity

86. The pole zero plot of open loop transfer function system shown below and the steady state gain is 2, the transfer function of the system will be given by



$$\frac{10(s+1)}{s^2+4s+5}$$

87. Consider the following single loop feedback structure illustrating the return difference



The return difference of A is

$1 + A\beta$

88. Consider the following statements regarding advantages of closed loop negative feedback control systems over open loop systems.

a. The overall reliability of the closed loop system is more than that of open loop system

b. The transient response in a closed loop system decays more quickly than open loop system

c. In an open loop system, closing of the loop increases the overall gain of the system

d. In the closed loop system, the effect of variation of component parameters on its performance is reduced.

(i) and (ii)

89. A forcing function $(t^2 - 2t)u(t-1)$ is applied to a linear system. The Laplace transform of the forcing function is

$$\frac{2 - s^2}{s^3} e^{-s}$$

90. Compensator which adds negative phase to system over specified frequency range is called

Lag

91. In control systems, when maximum value is subtracted from step value and result is divided by step value, result is called as

Percentage undershoot

92. Lead compensator has a pole to the

left of zero

93. A first order dynamic system is represented by the differential equation The $5\dot{x}(t) + x(t) = u(t)$. corresponding transfer function and state space representation are

$H(s) = \dfrac{1}{1+5s}$ and $\boldsymbol{x^{\cdot} = -0.2x + 0.5u, y = 0.4}x$

94. Consider the system represented by $\dot{x} = Ax + Bu$, where $A = \begin{bmatrix} 0 & 5 \\ 0 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$. The associated state transition matrix is

$$\Phi(t,0) = \begin{bmatrix} 1 & 5t \\ 0 & 1 \end{bmatrix}$$

95. A system has a characteristic equation $s^3 + Ks^2 + (1+K)s + 6 = 0$. The range of K for a stable system is____________________.

K>2

96. Use of Routh array to assist in computing the roots of the polynomial function, $P(s) = 2s^3 + 2s^2 + s + 1 = 0$.

$$\boldsymbol{S_1 = -1,\ S_{2,3} = \pm j\frac{1}{\sqrt{2}}}$$

97. A system has a characteristic equation $s^3 + 10s^2 + 2s + 30 = 0$. The system is_____________.

unstable

98. The amplitude of the closed loop response is reduced approximately to one fourth of the maximum value in one oscillatory period. This definition belongs to

Asymptote

99. A method of selecting one or two parameters using the root locus method is called as____________.

Angle of departure

100. All zeros of a transfer function lies in the left hand side of the S –plane, then the system is__.

Minimum phase

101. The relationship between autocorrelation function(ACF) and power spectral density (PSD) is

Fourier transform of ACF is equal to PSD

102. For a particular case of amplitude modulation (AM) using sinusoidal modulating wave, the percentage modulation is 20%. The average power in the carrier signal is_______.

98%

103. In AM, spectral overlap is said to occur if the lower sideband for positive frequencies overlaps with its image for negative frequencies. What condition must the modulated wave satisfy if you are to avoid spectral overlap? Hint: the message signal bandwidth is W.

Carrier frequency $f_c > W$

104. Which statement is correct for envelope detector

The carrier frequency is large compared to the message bandwidth

105. To minimize the granular noise, the step size must be_________.

small

106. In PCM for Q quantity levels, the number of pulses P in a code group is given by ______

$\log_2(Q)$

107. Pulse width modulation involves

Varying width of pulses in the pulse train according to instantaneous variations of message signal

108. Consider the signal $x(t) = m(t)\cos 2\pi f_c t + \hat{m}(t)\cos 2\pi f_c t$ where $\hat{m}(t)$ denotes the Hilbert transform of $m(t)$ and the bandwidth of $m(t)$ is very small compared to f_c. The signal $x(t)$ is a _______________.

band pass signal

109. The modulation scheme commonly used for transmission from GSM mobile terminal is _________.

Gaussian Minimum Shift Keying

110. A zero mean white noise is passed through an ideal low pass filter of bandwidth 10kHz. The output is the uniformly sampled with sampling period t_s = 0.03m/sample. The samples so obtained would be____________________.

statistically independent

111. In what type of multiplexing does each signal occupy the article entire bandwidth of the channel?

TDM

112. The ability of the receiver to select the wanted signals among the various incoming signals is termed as______________.

Selectivity

113. A 400W carrier is amplitude modulated with m = 0.75. The total power in AM is_________.

512W

114. Non-coherent detection is not possible for

PSK

115. A telephone exchange has 9000 subscribers. If the number of calls originating at peak time is 10000 in one hour, the calling rate is_________.

1.11

116. If C is the noise channel capacity bits/s, δf is bandwidth in Hz and S/N is signal to noise ratio, then

$$C = \delta f \log_2\left(1 + S/N\right)$$

117. Consider the following statements

a. The amplitude of an FM wave is constant

b. FM is more immune to noise than AM

c. FM broadcasts operate in upper VHF and UHF frequency ranges

d. FM transmitting and receiving equipment are simpler as compared to AM transmitting and receiving equipment.

Which of the above are correct?

(i), (ii), (iii)

118. When the channel is noisy. Producing a conditional probability of error $\rho = 0.5$; the channel capacity and entropy function will be_______and________.

0 and 1

119. If transmission bandwidth is doubled in FM, SNR is___________.

decreased four times

120. The bandwidth of DSB suppressed carrier modulation system when the modulating frequency varies between 500Hz and 5kHz is

9kHz

121 A super heterodyne receiver I s to operate in the frequency range 550kHz – 1650kHz, with the intermediate frequency of 450kHz. Let $R = \frac{C_{\min}}{C_{\max}}$ denote the required capacitance ratio of the local oscillator and I_f represents the image frequency in (kHz) of the incoming signal. If the receiver is tuned to 700kHz, then R and I_f will be_______.

R = 4.41, I_f **=1600**

122. Given $A = 2a_x + 4a_y - 3a_z$ and $B = a_x - a_y$. The $A \times B$ is_________________.

$\boldsymbol{-3a_x - 3a_y - 6a_z}$

123. Gauss's law states that________________________________.

The total flux out of a closed surface is equal to the net charge within the surface

124. Divergence of the vector field A at the point P is defined by________________________.

$$\lim_{\Delta v \to 0} \frac{\oint A.dS}{\Delta v}$$

125. Five equal point charges, $Q = 20nC$ are located at $x = 2,3,4,5,6m$. The potential at the origin is_________________.

261V

126. The intrinsic impedance for partially medium is____________________.

$$\sqrt{\frac{j\omega\mu}{\sigma + j\omega\varepsilon}}$$

127. The skin depth at a frequency of 1.6MHz in aluminum is________________________, where $\sigma = 38.2\ {}^{MS}\!/_{m}$, $\mu_r = 1$.

64.4μm

128. The voltage standing wave ratio (VSWR) is calculated by____________________.

$$\frac{1+|\Gamma_R|}{1-|\Gamma_R|}$$

129. The major difference between the rectangular and cylindrical waveguides as power transmitters when each operates in its dominant mode.

Geometrical factor

130. A loss-less air dielectric cylindrical waveguide of inside diameter 3cm, is operated at 14GHz. For the TM_{11} mode propagating in the +Z direction, the wave impedance is_______________.

185Ω

131. An air filled rectangular wave guide has dimensions a = 2 cm, b = 1 cm. The range of frequencies over which the guide will operate single mode (TE_{10})_________.

7.5 – 15 GHz

132. A 50Ω lossless transmission line is terminated by a load impedance, $Z_L = 50 - j75\Omega$. If the incident power is 100mW, the power dissipated by the load is__________.

64 mW

133. The directivity of an antenna is the_______________value of its directive gain.

maximum

134. A conductor of a length_____________normal to an infinite conducting plane forms a monopole antenna.

L/2

135. A Hertizian dipole of length L=2m operates at 1MHz. If the copper conductor has $\sigma_c = 57\ {}^{MS}\!/_{m}$, $\mu_r = 1$, and radius $a = 1mm$, then the radiation efficiency is_______________.

29.4%

136. A 1cm radius circular loop antenna has N turns and operates at 100MHz. If radiation resistance is 10Ω, then N will be_______________.

515

137. Identify the drawbacks of RADAR.

It has very narrow coverage

138. The RADAR acronym is______________.

Radio detection and ranging

139. Identify the wrong components in an optical transmitter

photo detector

140. The single mode fibers support only the______________mode.

HE_{11}

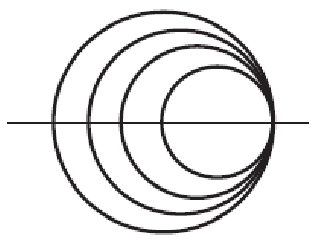
141. In graded index fiber, the refractive index__________inside the core.

decreases gradually

142. Signal transmission in fiber optic communication systems takes place through the ________ modes only.

Guided mode

143. Many circles are drawn in a Smith chart used for transmission line calculations. The circle shown in the figure represent_______.

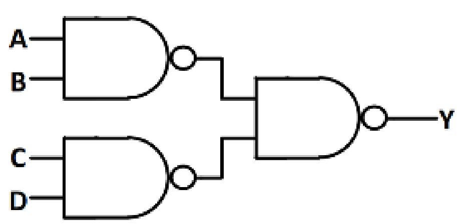


Constant resistance circles

144. A transmission line is distortion less if_________.

LG = RC

145. In the logic circuit shown in the figure, Y is given by



$$\boldsymbol{Y = AB + CD}$$

146. The transmitted signal in a GSM system is of 200 kHz bandwidth and 8 users share a common bandwidth using TDMA. If at a given time 12 users are talking in a cell, the total bandwidth of the signal received by the base station of the cell will be at least (in kHz) ________

400 kHz

147. An air-filled rectangular waveguide has inner dimensions of 3 cm X 2 cm. The wave impedance of the TE20 mode of propagation in the waveguide at a frequency of 30 GHz is (free space impedance η0 =377 Ω)

400 Ω

148 .A two-port network is known to have the following scattering matrix.If port 2 is terminated with a matched load, what is the return loss seen at port 1

$$[s] = \begin{bmatrix} 0.15\angle 0^\circ & 0.85\angle -45^\circ \\ 0.85\angle 45^\circ & 0.2\angle 0^\circ \end{bmatrix}$$

16.5dB

149. A magnetic field strength of 5 μA/m is required at a point on θ= π/2, 2 km from an antenna in air. Neglecting ohmic loss, how much power must the antenna transmit if it is a half-wave dipole?

144 mW

150.For a plastic fiber, refractive index of core is 1.6 and refractive index of cladding is 1.49, thenumerical aperture is equal to

0.58