2011

PART 07 – ELECTRONICS AND COMMUNICATION ENGINEERING

(Answer ALL questions)

76. An average responding rectifier type electronic ac voltmeter has its scale calibrated in terms of the rms value of a sine wave. If a square wave voltage of peak amplitude of 100 V is measured using this voltmeter, what will be the reading indicated by the meter?

1) 111 V 2) 100 V 3) 90.09 V 4) 70.7 V

77. A three input NAND gate is to be used as an inverter. Which one of the following measures will achieve better results?

1) The two inputs not used are kept open
2) The two inputs not used are connected to the ground (logic 0 level)
3) The two inputs not used are connected to the logic high level
4) Only one input is kept open and the other two inputs are either connected to the logic low or logic high state

78. A D/A converter has 5V full scale output voltage and an accuracy of ±0.2%. The maximum error for any output voltage will be

1) 5 mV 2) 10 mV
3) 20 mV 4) 25 mV

79. The ON voltage and forward breakover voltage of an SCR depend on the

1) gate current alone
2) bandgap of the semiconductor alone
3) gate current and the semiconductor bandgap respectively
4) applied voltage alone

80. A series RL circuit is initially relaxed. A step voltage is applied to the circuit, If τ is the time constant of the circuit, the voltage across R and L will be the same at time t equal to

1) $\tau \log_e 2$ 2) $\tau \log_e (1/2)$
3) $(1/\tau) \log_e$ 4) $(1/\tau) \log_e(1/2)$

81. The dissipation at the collector is in the quiescent state and increases with the excitation in the case of a

1) Class A series fed amplifier
2) Class A transistor coupled amplifier
3) Class AB amplifier
4) Class B amplifier

82. The interface chip used for data transmission between 8086 and a 16-bit ADC is

1) 8259 2) 8255
3) 8253 4) 8251

83. To avoid thermal runaway in the design of an analog circuit, the operating point of the BJT should be such that it satisfies the condition

1) $V_{CE} = 0.5\, V_{CC}$ 2) $V_{CE} \le 0.5 V_{CC}$
3) $V_{CE} \ge 0.5\, V_{CC}$ 4) $V_{CE} \le 0.78\, V_{CC}$

84. If a class C power amplifier has an input signal with frequency of 200 KHz and the width of collector current pulses of 0.1 μs, then the duty cycle of the amplifier will be

1) 1% 2) 2% 3) 10% 4) 20%

85. In a feedback series regulator circuit, the output voltage is regulated by controlling the

1) magnitude of the input voltage
2) gain of the feedback transistor
3) reference voltage
4) voltage drop across the series pass transistor

86. Which one of the following types of hollow cavity resonators of the same surface would have the highest Q factor?

1) Spherical cavity made of copper
2) Spherical cavity made of silver
3) Cylindrical cavity made of copper
4) Cylindrical cavity made of silver

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87. For a dominant mode, in a rectangular waveguide with breadth 10 cm, the guide wavelength for a signal of 2.5 GHz will be

1) 20 cm 2) 18 cm
3) 15 cm 4) 12 cm

88. For an open ended rectangular waveguide antenna of size 0.9"×0.4" excited in the TE_{10} (dominant) mode at 1=3 cm, the gain is nearly

1) 1.5 2) 2.5 3) 26.5 4) 36.5

89. Radiation from a helical antenna is

1) plane polarised
2) partially plane polarised
3) circularly polarised
4) elliptically polarised

90. A loss less line having characteristic impedance Z_0 is terminated in a pure reactance of value $-jZ_0$. The VSWR of the line will be

1) 10 2) 2 3) 1 4) ∞

91. For a parabolic reflector antenna with diameter of 3 m, the far field pattern measurement at 10 GHz should be carried out at a distance of atleast

1) 30 m 2) 200 m 3) 400 m 4) 600 m

92. In a microwave measurement setup, the power reaching to the load is found to be 50 mW. If a 3 dB coupler is placed before the load, the power to the load will be

1) 50 mW 2) 25 mW
3) 12.5 mW 4) 6.25 mW

93. Which one of the following frequency bands is allocated by ITU (International Telecommunication Union) for DTH (Direct to Home Service)?

1) (14/12) GHz 2) (6/4) GHz
3) (2/1) GHz 4) (42/40) GHz

94. The extended range propagation occurs due to

1) high conductivity of the ground
2) low conductivity of the ground
3) blobs of different dielectric constants randomly distributed in the volume of the upper atmosphere
4) high conductivity of the upper atmosphere

95. For a Gunn diode, the drift velocity of electron through active drift region is 10^7 cm/s and the active region is 10×10^{-4} cm. The critical voltage of the diode (critical field = 3.2 kV/cm) is

1) 0.032 V 2) 0.32 V
3) 3.2 V 4) 32 V

96. A FM signal with a deviation δ is passed through a mixer and has its frequency reduced fivefold. The deviation in the output of the mixer is

1) δ 2) 5 δ
3) δ/5 4) intermediate

97. The purpose of source coding is to

1) increase the information transmission rate
2) decrease the information transmission rate
3) decrease the S/N ratio
4) decrease the probability of error

98. The channel capacity under the Gaussian noise environment for a discrete memoryless channel with a bandwidth of 4 MHz and SNR of 31 is

1) 20 Mbps 2) 4 Mbps
3) 8 Kbps 4) 4 Kbps

99. A message signal band limited to 5 KHz is sampled at the minimum rate as dictated by the sampling theorem. The number of quantisation levels is 64. If the samples are encoded in binary form, the transmission rate is

1) 60 Kbps 2) 50 Kbps
3) 32 Kbps 4) 10 Kbps

100. PAM signals can be demodulated by using a

1) low pass filter alone
2) a Schmitt trigger followed by LPF
3) a differentiator followed by LPF
4) a clipper circuit followed by LPF

101. In an ADM transmission system, the output signal amplitudes for 1's and 0's are

1) fixed and the reception rate is also fixed
2) fixed but the reception rate is variable
3) variable and the repetition rate is variable
4) variable but the repetition rate is fixed

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102. In optical communication, the losses in optical fibres can be caused by

a) impurities

b) microbending

c) attenuation in glass

d) stepped index operation

Which of these statements are correct?

1) (a), (b) and (c) 2) (a), (c) and (d)
3) (a), (b) and (d) 4) (b), (c) and (d)

103. The bandwidth of a 'N' bit binary coded PCM signal for modulating a signal having bandwidth of 'f' Hz is

1) f / N Hz 2) (f / N^2) Hz
3) Nf Hz 4) N^2f Hz

104. A glass fibre has refractive indices of 1.5 and 1. Assuming $c=3\times10^8$ m/s the multipath time dispersion will be

1) 2.5 ns/m 2) 2.5 μs/m
3) 5 ns/m 4) 5 μs/m

105. The protocol layer associated with multiplexing and cell switching functions is the

1) ATM Adaptation Layer
2) ATM Layer
3) Physical Layer
4) Session Layer

106. While forming Routh's array, the situation of a row of zeros indicates that the system

1) has symmetrically located roots
2) is not sensitive to variations in gain
3) is stable
4) is unstable

107. The value of 'K' for which the unity feedback system $G(s)=K/(s(s+2)(s+4)$ crosses the imaginary axis is

1) 4 2) 16 3) 48 4) 84

108. In the 2nd order control system the value of the resonant peak will be unity when the damping ratio has a value of

1) Zero 2) Unity
3) $1/\sqrt{2}$ 4) $\sqrt{2}$

109. How many roots of the characteristic equation $s^5+s^4+2s^3+2s^2+3s+15=0$ lie in the left half of the s-plane?

1) 1 2) 3 3) 5 4) 7

110. For a 2nd order transfer function $T(s)=4/(s^2+2s+4)$, the maximum resonance peak will be

1) 4 2) 4/3
3) 2 4) $2/\sqrt{3}$

111. Laplace transform of $f(t)=\sin^2 t$ is

1) $1/\{s+4\}$ 2) $1/\{s-4\}$
3) $2/\{s(s^2+4)\}$ 4) $2/\{s(s^2-4)\}$

112. A causal LTI system with rational system function H(z) is stable if and only if all the poles of H(z) lie inside the unit circle i.e., they must all have magnitude.

1) greater than 1
2) less than 1
3) greater than and equal to 1
4) equal to zero

113. The system $y(n)=x(n-2)-2x(n-17)$ is a

1) DT dynamic system 2) DT static system
3) CT static system 4) Arbitrary system

114. The number of points required in DFT when 50 ms signal has no significant spectral content above 500 Hz with a resolution of 10 Hz is

1) 50 2) 60 3) 70 4) 100

115. A system has the transfer function (1–s)/(1+s). It is a

1) non-minimum phase system
2) minimum phase system
3) low pass system
4) second order system

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76..... 1	77..... 3	78..... 2	79..... 3	80..... 1	81..... 4	82..... 4	83..... 2	84..... 2	85..... 2
86..... 1	87..... 3	88..... 2	89..... 3	90..... 4	91..... 1	92..... 3	93..... 2	94..... 4	95..... 3
96..... 1	97..... 4	98..... 1	99..... 1	100..... 4	101..... 2	102..... 4	103..... 3	104..... 2	105..... 1
106..... 4	107..... 1	108..... 3	109..... 2	110..... 4	111..... 3	112..... 2	113..... 1	114..... 4	115..... 1

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78. (2)

$$\text{Maximum error} = \frac{0.2}{100} \times 5 = 10 \text{ mV}$$

90. (4)

$$|\rho| = \frac{\sqrt{Z_0^2 + Z_0^2}}{\sqrt{Z_0^2 + Z_0^2}} = \frac{\sqrt{Z}\, Z_0}{\sqrt{Z}\, Z_0} = 1$$

$$\text{VSWR} = \frac{1+\rho}{1-\rho} = \frac{1+1}{1-1} = \frac{2}{0} = \infty$$

95. (3)

$$\begin{aligned} \text{Critical voltage V} &= \ell \times \text{critical field} \\ &= 10 \times 10^{-4} \times 3.2 \text{ kV/cm} \\ &= 10 \times 10^{-4} \times 3.2 \times 10^3 \text{ V/cm} \\ &= 3.2 \text{ V} \end{aligned}$$

98. (1)

$$\begin{aligned} B \log_2[1+31] &= 4 \log_2[32] \\ &= 4 \log_2 2^5 \\ &= 20 \text{ Mbps} \end{aligned}$$

110. (4)

$$\varepsilon = \frac{2}{2\omega n} = \frac{2}{2 \times 2} = 0.5$$

$$\mu_p = e^{-\pi\varepsilon/\sqrt{1-\varepsilon^2}}$$

$$\text{Maximum value} = 1 + 0.16 = \frac{2}{\sqrt{3}}$$

114. (4)

$$\begin{aligned} f_m &= 500 \text{ Hz} \\ f_s &= 2f_m = 2 \times 500 \\ &= 1000 \text{ Hz} \end{aligned}$$

$$T = \frac{1}{1000} = 0.001 \text{ S}$$

$$\Delta f = \frac{2f_m}{N}$$

$$10 = \frac{1000}{N}$$

$$N = 100$$