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BATHINDA

Ph.D. Entrance Examination of ECE

Q1. In PCM system, if the quantization levels are increases from 2 to 8, the relative bandwidth requirement will

- a) Remain same
- b) Be doubled
- c) Be tripled
- d) Be four times

Q2. A delta modulator has input message signal,  $m(t)=4\sin(2\pi 10t)+5\sin(2\pi 20t)$ . If the step size is  $0.05\pi$ , then what is the minimum sampling frequency to prevent the slope overload error.

- a) 3200 Hz
- b) 1600 Hz
- c) 6400 Hz
- d) 5600 Hz

Q3. Consider a real-valued base-band signal  $x(t)$ , band limited to 10 kHz. The Nyquist rate for the signal

$y(t) = x(t)x(1 + \frac{t}{2})$  is

- a) 15 kHz
- b) 30 kHz
- c) 60 kHz
- d) 20 kHz

Q4. For a PM modulator with a deviation sensitivity  $K = 2.5\text{rad/V}$  and a modulating signal  $v_m(t) = 2 \cos(2\pi 2000t)$ , the peak phase deviation  $m$  will be

- a) 1.25rad
- b) 2.5rad
- c) 5.0rad
- d) 7.5rad

Q5.  $A_c m(t) \cos(\omega_c t + \theta)$  is an example of

- a) DSB-SC
- b) SSB
- c) Angle Modulation
- d) DSB-FC

Q6. A Si doped with  $10^{17} \text{ cm}^{-3}$  phosphorus atoms has an electron mobility of  $1300 \text{ cm}^2/\text{V-s}$  at room temperature. How long does it take an average electron to drift  $1 \mu\text{m}$  in given Si sample at an electric field of  $100 \text{ V/cm}$ ?

- a) 0.8 ns
- b) 0.8 ps
- c)  $0.8 \mu\text{s}$
- d) 0.8 ms

Q7. Ebers-Moll model is applicable to

- a) BJT
- b) NMOS
- c) UJT
- d) JFET

Q8. Consider a common emitter current gain of  $\beta = 150$  and a base current of  $i_B = 15 \mu\text{A}$ . If the transistor is biased in the forward active mode, the collector and emitter current will be

- a) 2.25mA and 2.27mA
- b) 3.25 mA and 2.27mA
- c) 2.25 mA and 1.37 mA
- d) 3.25 mA and 1.37 mA

- Q9. The magnitude of the energy gap for an insulator is
- less than 1 eV
  - between 2 eV to 3 eV
  - more than 3 eV
  - between 1 eV to 2 eV
- Q10. Which of the following are the advantages of silicon over Insulator (SOI)?
- Lower diffusion capacitance
  - Smaller parasitic delay and lower dynamic power consumption
  - Lower threshold voltages
- Select the correct answer using the code given below.
- 1, 2 and 3
  - 1 and 2 only
  - 1 and 3 only
  - 2 and 3 only
- Q11. What is the drain current for a D-MOSFET having the characteristic values  $I_{DSS}$  of 10mA,  $V_{GS(0)}$  of -4 v and  $V_{GS}$  of +2V?
- 22.5 mA
  - 17.5 mA
  - 12.5 mA
  - 2.5 mA
- Q12. When the reverse current in a Zener diode increases from 20mA to 30mA, the Zener voltage changes from 5.6V to 5.65V. the Zener resistance is
- 2 Ohm
  - 3 Ohm
  - 4 Ohm
  - 5 Ohm
- Q13. A transistor connected in common-base configuration has
- A low input resistance and a high output resistance
  - A high input resistance and a high output resistance
  - A high input resistance and a low output resistance
  - A low input resistance and a low output resistance
- Q14. A capacitor behaves as
- a dc open
  - an ac short
  - a dc open and an ac short
  - a dc short and an ac open
- Q15. The decimal value of the signed binary number 10101010 expressed in 2's complement will be
- 42
  - 116
  - 170
  - 86
- Q16. In a p-MOSFET, the source is
- heavily doped p type
  - lightly doped p type
  - heavily doped n type
  - lightly doped n type

Q17. If VSWR is infinite, the transmission line is terminated in

- a) short circuit
- b) complex impedance
- c) open circuit
- d) either a or c

Q18. The reflection coefficient on a line is  $0.5 \angle 45^\circ$ . The SWR is

- a) 0.8
- b) 1.1
- c) 1.2
- d) 7.5

Q19. The depth of penetration  $\delta$  of a plane electromagnetic wave incident normally on a good conductor is

- a)  $\frac{1}{\sqrt{2f\pi\mu\sigma}}$
- b)  $\frac{1}{\sqrt{f\pi\mu\sigma}}$
- c)  $\frac{2}{\sqrt{3f\pi\mu\sigma}}$
- d)  $\frac{2}{\sqrt{f\pi\mu\sigma}}$

Q20. The characteristic impedance of an 80 cm long lossless transmission line having  $L=0.25 \mu\text{H/m}$  and  $C=100 \text{ pF/m}$  will be

- a)  $25 \Omega$
- b)  $40 \Omega$
- c)  $50 \Omega$
- d)  $80 \Omega$

Q21. The attenuation (magnitude) produced by a lead compensator at the frequency of maximum phase lead  $\omega_m = \sqrt{ab}$  is

- a)  $\sqrt{\frac{b}{a}}$  or  $\sqrt{\frac{a}{b}}$
- b)  $\sqrt{a+b}$
- c)  $\sqrt{b-a}$
- d) None of these

Q22. The lowest Eigen value of the  $2 \times 2$  matrix  $\begin{bmatrix} 4 & 2 \\ 1 & 3 \end{bmatrix}$  is

- a) 1
- b) 2
- c) 3
- d) 5

Q23. The solution of the differential equation

$$(1 + y^2)dx = (\tan^{-1} y - x)dy \text{ is}$$

- a)  $x = \tan^{-1} y + 1 + ce^{-\tan^{-1} y}$
- b)  $x = \tan^{-1} y - 1 + ce^{-\tan^{-1} y}$
- c)  $x = \frac{1}{2} \tan^{-1} y - 1 + ce^{-\tan^{-1} y}$
- d)  $x = \frac{1}{2} \tan^{-1} y + 1 + ce^{-\tan^{-1} y}$

Q24. The general value of  $\log(1+i) + \log(1-i)$  is

- a)  $\log 2 - 4n\pi i$
- b)  $\log 2 + 4n\pi i$
- c)  $\log 2 + 2n\pi i$
- d)  $\log 2 - 2n\pi i$

Q25. A committee of 4 is to be formed from among 4 girls and 5 boys. What is the probability that the committee will have number of boys less than number of girls?

- a) 2/9
- b) 4/9
- c) 4/5
- d) 1/6

Q26. While calculating  $R_{th}$  in Thevenin's theorem and Norton equivalent

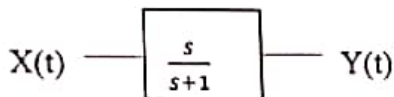
- a) all independent sources are made dead
- b) only current sources are made dead
- c) only voltage sources are made dead
- d) all voltage and current sources are made dead

Q27. A negative feedback system has a loop transfer function  $G(s)H(s) = K \frac{(s+2)}{s(s-1)}$

What will be the value of the gain K so that the damping ratio ( $\xi$ ) for stable system is 0.707?

- a)  $K < 0$
- b)  $K > 0$
- c)  $K > 1$
- d)  $K < 1$

Q28. In the system shown in figure, the input  $x(t) = \sin(t)$ . In steady state, the response  $y(t)$  will be



- a)  $\frac{1}{\sqrt{2}} \sin(t - 45^\circ)$
- b)  $\frac{1}{\sqrt{2}} \sin(t + 45^\circ)$
- c)  $\sin(t - 45^\circ)$
- d)  $\sin(t + 45^\circ)$

Q29. The gain margin of a system is 0 dB. It represents a

- a) Stable
- b) Unstable system
- c) Conditionally stable system
- d) Marginally stable system

Q30. Zero initial conditions means that system is

- a) Working with zero stored energy
- b) Working with zero reference signal
- c) At rest and no energy is stored in any of its components
- d) None of these

Q31. Consider the open loop transfer function of a system given below.

$$G(s)H(s) = \frac{K}{(s^2 + 2s + 2)(s^2 + 6s + 10)}$$

The breakaway point in the root locus plot for the system are

- a) 3 real
- b) Only real
- c) 1 real, 2 complex
- d) None

Q32. For a two-port network, the condition of Reciprocity in terms of h-parameter is

- a)  $h_{12} = h_{21}$
- b)  $h_{12} = h_{22}$
- c)  $h_{12} = -h_{21}$
- d)  $h_{12} = -h_{22}$

Q33. A unity feedback system is characterized by the open loop transfer function

$$G(s) = \frac{1}{s(0.5s+1)(0.2s+1)}$$

The steady state errors for unit-step and unit-ramp inputs are respectively

- a) 0 and 0
- b) 0 and 1
- c) 1 and 0
- d) 1 and 1

Q34. Master-Slave flip-flop is also called

- (a) Pulse triggered flip-flop
- (b) Latch
- (c) Level triggered flip-flop
- (d) Buffer

Q35. A logic circuit that accepts several data inputs and allows only one of them at a time to get through to the output is called

- a) Multiplexer
- b) De-multiplexer
- c) Transmitter
- d) Receiver

Q36. A cascaded arrangement of flip-flops where the output of one flip-flop drives the clock input of the following flip-flop, is known as

- a) Synchronous counter
- b) Ripple counter
- c) Ring counter
- d) Up counter

Q37. In a series R-L circuit, R is  $10\Omega$  and L is 20 mH, if the circuit current is  $10 \sin 314 t$  A, the phase angle  $\theta$  between  $v$  and  $i$  will be

- a)  $\tan^{-1}(0.2\pi)$
- b)  $\tan^{-1}(0.4\pi)$
- c)  $\tan^{-1}(0.6\pi)$
- d)  $\tan^{-1}(0.8\pi)$

Q38. Which one of the following statements regarding slew rate is correct?

- a) It signifies how rapidly the output of an op-amp can change in response to changes in the frequency of the input signal
- b) It does not change with change in voltage gain
- c) It should be smaller for high-speed op-amp applications
- d) It is not fixed for an op-amp

Q39. Which one of the following is correct for an ideal operational amplifier?

- a) Input resistance  $R_i = \infty$ , output resistance  $R_o = 0$  and bandwidth = 0
- b) Input resistance  $R_i = 0$ , output resistance  $R_o = \infty$  and bandwidth = 0
- c) Input resistance  $R_i = \infty$ , output resistance  $R_o = 0$  and bandwidth =  $\infty$
- d) Input resistance  $R_i = 0$ , output resistance  $R_o = 0$  and bandwidth =  $\infty$

Q40. According to Kirchhoff's voltage law, the algebraic sum of all the voltage in any closed loop of a network is always

- a) Negative
- b) Positive
- c) Zero
- d) Determined by the battery emf

### Answer Key (ECE)

Question No.	Ans
1	C
2	D
3	B
4	C
5	A
6	A
7	A
8	A
9	C
10	A
11	A
12	D
13	A
14	C
15	D
16	A
17	D
18	D
19	B
20	C
21	A
22	B
23	B
24	C
25	D
26	A
27	C
28	B
29	D
30	C
31	D
32	C
33	B
34	A
35	A
36	B
37	A
38	A
39	C
40	C

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