

## **Electronics Corporation of India Limited ECIL GET Recruitment Sample Paper for Electronics and Communication**

**1.The current I in the given network.**

- a) 1A
- b) 3A
- c) 5A
- d) 7A

**2.For the Delta- Wye transformation in given figure, the value of the resistance R is.**

- a)  $1/3$  ohms
- b)  $2/3$  ohms
- c)  $3/2$  ohms
- d) 3 ohms

**3.In the given network, the Thevenin's equivalent as seen by the load resistance Rl is**

- a)  $V=10$  V,  $R= 2$ ohms
- b)  $V=10$ V,  $R=3$  ohms
- c)  $V=15$ V,  $R= 2$ ohms
- d)  $V=15$ V,  $R=3$  ohms

**4.The current I in a series R-L circuit with  $R=10$  ohms and  $L=20$ mH is given by  $i=2\sin 500t$   
A. If v is the voltage across the R-L combination then i**

- a) lags v by 45 degree
- b) is in-phase with v
- c) leads v by 45
- d) lags v by 90

**5. In the given network, the mesh current  $I$  and the input impedance seen by the 50 V source, respectively, are**

- a)  $125/13$  A and  $11/8$  ohms
- b)  $150/13$  A and  $13/8$  ohms
- c)  $150/13$  A and  $11/8$  ohms
- d)  $125/13$  A and  $13/8$  ohms

**6. A voltage source having a source impedance  $Z = R + jX$  can deliver maximum Average power to a load impedance  $Z$ , when**

- a)  $Z = R + jX$
- b)  $Z = R$
- c)  $Z = jX$
- d)  $Z = R - jX$

**7. In the given circuit, the switch  $S$  is closed at  $t=0$ . Assuming that there is no initial Charge in the capacitor, the current  $i(t)$  for  $t>0$  is**

- a)  $V/R e^{(-2t/RC)}$
- b)  $V/R e^{(-t/RC)}$
- c)  $V/2R e^{(-2t/RC)}$
- d)  $V/2R e^{(-t/RC)}$

**8. For the circuit in given figure, if  $e(t)$  is a ramp signal, the steady state value of the Output voltage  $v(t)$  is**

- a) 0
- b) LC
- c) R/L
- d) RC

**9. For the series RLC circuit in given figure, if  $\omega=1000$  rad/sec, then the current  $I$  (in Amperes) is**

- a)  $2 \angle -15^\circ$
- b)  $2 \angle 15^\circ$
- c)  $\sqrt{2} \angle -15^\circ$
- d)  $\sqrt{2} \angle 15^\circ$

**10. The Y-parameter matrix (mA/V) of the two-port given network is**

- a)  $\begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}$
- b)  $\begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$
- c)  $\begin{bmatrix} 1 & -2 \\ -1 & 2 \end{bmatrix}$
- d)  $\begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$

**11. The maximum number of trees of the given graph is**

- a) 16
- b) 25
- c) 100
- d) 125

**12. Given figure shows a graph and one of its trees. Corresponding to the tree, the group of branches that CAN NOT constitute a fundamental cut set is**

- a) 1,2,3
- b) 1,4,6,8,3
- c) 5,6,8,3
- d) 4,6,7,3

**13. The Y-parameter matrix of a network is given by  $Y = \begin{bmatrix} 1 & 1 \\ -1 & 1 \end{bmatrix}$  A/V. The Z<sub>11</sub> parameter of the same network is**

- a)  $\frac{1}{2}$  ohms
- b)  $\frac{1}{\sqrt{2}}$  ohms

- c) 1 ohms
- d) 2 ohms

**14. For the given circuit, the switch was kept closed for a long time before opening it at  $t=0$ . The voltage  $v(0^+)$  is**

- a) -10 V
- b) -1 V
- c) 0V
- d) 10 V

**15. The input impedance of a series RLC circuit operating at frequency  $\omega = \sqrt{2}w$ ,  $w$  being the resonant frequency, is**

- a)  $R - j(\omega L / \sqrt{2})$  ohms
- b)  $R + j(\omega L / \sqrt{2})$  ohms
- c)  $R - j\sqrt{2}\omega L$  ohms
- d)  $R - j\sqrt{2}\omega L$  ohms

**16. The threshold voltage  $V$  is negative for**

- a) an n-channel enhancement MOSFET
- b) an n-channel depletion MOSFET
- c) an p-channel depletion MOSFET
- d) an p-channel JFET

**17. At a given temperature, a semiconductor with intrinsic carrier concentration  $n_i = 10^{16} / m^3$  is doped with a donor dopant of concentration  $N_d = 10^{26} / m^3$ . Temperature remaining the same, the hole concentration in the doped semiconductor is**

- a)  $10^{26} / m^3$
- b)  $10^{16} / m^3$
- c)  $10^{14} / m^3$

d)  $10^6 / \text{m}^3$

**18. At room temperature, the diffusion and drift constants for holes in a P-type semiconductor were measured to be  $D_p = 10 \text{ cm}^2/\text{s}$  and  $\mu_p = 1200 \text{ cm}^2/\text{V-s}$ , respectively. If the diffusion constant of electrons in an N-type semiconductor at the same temperature is  $D_n = 20 \text{ cm}^2/\text{s}$ , the drift constant for electrons in it is**

a)  $\mu_n = 2400 \text{ cm}^2/\text{V-s}$

b)  $\mu_n = 1200 \text{ cm}^2/\text{V-s}$

c)  $\mu_n = 1000 \text{ cm}^2/\text{V-s}$

d)  $\mu_n = 600 \text{ cm}^2/\text{V-s}$

**19. A common LED is made up of**

a) intrinsic semiconductor

b) direct semiconductor

c) degenerate semiconductor

d) indirect semiconductor

**20. When operating as a voltage regulator, the breakdown in a Zener diode occurs due to the**

a) tunneling effect

b) avalanche breakdown

c) impact ionization

d) excess heating of the junction.

**21. If the common base DC current gain of a BJT is 0.98, its common emitter DC current gain is**

a) 51

b) 49

c) 1

d) 0.02

**22. Negative resistance characteristics is exhibited by a**

- a) Zener diode
- b) Schottky diode
- c) photo diode
- d) Tunnel diode

**23. Let  $E_n$  and  $E_p$ , respectively, represent the effective Fermi levels for electrons and holes during current conduction in a semiconductor. For lasing to occur in a P-N junction of band-gap energy 1.2 eV,  $(E_n - E_p)$  should be**

- a) greater than 1.2eV
- b) less than 1.2eV
- c) equal to 1.1eV
- d) equal to 0.7eV

**24. In a P-well fabrication process, the substrate is**

- a) N-type semiconductor and is used to build P-channel MOSFET
- b) P-type semiconductor and is used to build P-channel MOSFET
- c) N-type semiconductor and is used to build N-channel MOSFET
- d) P-type semiconductor and is used to build N-channel MOSFET

**25. In a MOS capacitor with n-type silicon substrate, the Fermi potential  $\phi = -0.41$  V and the flat-band voltage  $V_{fb} = 0$  V. The value of the threshold voltage  $V_t$  is**

- a) -0.82 V
- b) -0.41 V
- c) 0.41 V
- d) 0.82

Refer given figure for question 26 and 27. Assume D1 and D2 to be ideal diodes.

**26. Which one of the following statements is true?**

- a) Both D1 and D2 are ON.
- b) Both D1 and D2 are OFF.
- c) D1 is ON and D2 is OFF.
- d) D2 is ON and D1 is OFF.

**27. Values of  $V_o$  and  $I$ , respectively, are**

- a) 2V and 1.1 mA
- b) 0V and 0 mA
- c) -2V and 0.7 mA
- d) 4V and 1.3 mA

**28. In a BJT CASCODE pair, a**

- a) common emitter follows a common base
- b) common base follows a common collector
- c) common collector follows a common base
- d) common base follows a common emitter

**29. Inside a 741 op-amp, the last functional block is a**

- a) differential amplifier
- b) level shifter
- c) class-A power amplifier
- d) class-AB power amplifier

**30. For the MOSFET in the given circuit, the threshold voltage  $V_t = 0.5V$ , the process parameter  $K_P = 150 \mu A/V^2$  and  $W/L = 10$ . The values of  $V_d$  and  $I_d$ , respectively, are**

- a)  $V_d = 4.5 V$  and  $I_d = 1 mA$
- b)  $V_d = 4.5 V$  and  $I_d = 0.5 mA$
- c)  $V_d = 4.8 V$  and  $I_d = 0.4 mA$

d)  $V_d = 6 \text{ V}$  and  $I_d = 0 \text{ mA}$

**31. A negative feedback is applied to an amplifier with the feedback voltage proportional to the output current. This feedback increases the**

- a) input impedance of the amplifier
- b) output impedance of the amplifier
- c) distortion in the amplifier
- d) gain of the amplifier

**32. The early effect in a BJT is modeled by the small signal parameter**

- a)  $r_0$
- b)  $r_{\pi}$
- c)  $g_m$
- d)  $\beta$

**33. For a given filter order, which one of the following type of filters has the least amount of ripple both in pass-band and stop-band?**

- a) Chebyshev type I
- b) Bessel
- c) Chebyshev type II
- d) Elliptic

**34. For a practical feedback circuit to have sustained oscillation, the most appropriate value of the loop gain T is**

- a) 1
- b) -1
- c) -1.02
- d) 1.02

**35. Assume the op-amps in given figure to be ideal. If the input signal  $v_i$  is a sinusoid of 2V peak-to-peak and with zero DC component, the output signal  $v_o$  is a**

- a) sine wave
- b) square wave
- c) pulse train
- d) triangular wave

**36. In a common source amplifier, the mid-band voltage gain is 40 dB and the upper cutoff frequency is 150kHz. Assuming single pole approximation for the amplifier the unity gain frequency  $f_T$  is**

- a) 6 MHz
- b) 15 MHz
- c) 150 MHz
- d) 1.5 GHz

**37. An op-amp is ideal except for finite gain and CMRR. Given the open loop differential gain  $A_d=2000$ ,  $CMRR = 1000$ , the input to the noninverting terminal is 5.002 V and the input to the inverting terminal is 4.999 V, the output voltage of the op-amp is**

- a) 14 V
- b) 24 V
- c) -6 V
- d) -8 V

**38. The op-amp in the circuit in given figure has a non-zero DC offset. The steady state value of the output voltage  $V_o$  is**

- a)  $-RC \, dv_s(t)/dt$
- b)  $-(1/RC) \int v_s(t) dt$
- c)  $-V$
- d)  $+V$

**39. For the circuit in given figure, if the value of the capacitor C is doubled, the duty-cycle of the output waveform  $V_o$**

- a) increases by a factor of 2
- b) increases by a factor of 1.44
- c) remains constant
- d) decreases by a factor of 1.44

**40. Assume the op-amp in the given circuit to be ideal. The value of the output voltage  $V_o$  is**

- a)  $3.2 V_i$
- b)  $4 V_i$
- c)  $9 V_i$
- d)  $10 V_i$

**41. The complement of the Boolean expression  $F = (X + Y + Z)(X + Z)(X + Y)$  is**

- a)  $XYZ + XZ + YZ$
- b)  $X^{\bar{}}YZ^{\bar{}} + XZ + X^{\bar{}}Y^{\bar{}}$
- c)  $X^{\bar{}}YZ^{\bar{}} + XZ + YZ$
- d)  $XYZ + X^{\bar{}}Y^{\bar{}}$

**42. The Boolean function  $F(A,B,C,D) = \sum(0,6,8,13,14)$  with don't care conditions  $d(A,B,C,D) = \sum(2,4,10)$  can be simplified to**

- a)  $F = B^{\bar{}}D^{\bar{}} + CD^{\bar{}} + ABC^{\bar{}}$
- b)  $F = B^{\bar{}}D^{\bar{}} + CD^{\bar{}} + ABC^{\bar{}}D$
- c)  $F = AB^{\bar{}}D^{\bar{}} + CD^{\bar{}} + ABC^{\bar{}}$
- d)  $F = B^{\bar{}}D^{\bar{}} + CD^{\bar{}} + ABCD$

**43. The Boolean function  $F = A^{\bar{}}D^{\bar{}} + B^{\bar{}}D$  can be realized by one of the following figures**

**44. For the multiplexer in given figure, the Boolean expression for the output Y is**

- a)  $A^{\bar{}}B^{\bar{}}+B^{\bar{}}C^{\bar{}}+AC$
- b)  $AB^{\bar{}}+B^{\bar{}}C^{\bar{}}+AC^{\bar{}}$
- c)  $AB^{\bar{}}+B^{\bar{}}C+AC$
- d)  $A^{\bar{}}B^{\bar{}}+B^{\bar{}}C+A^{\bar{}}C$

**45. Which one of the following is TRUE?**

- a) Both latch and flip-flop are edge triggered.
- b) A latch is level triggered and a flip-flop is edge triggered.
- c) A latch is edge triggered and a flip-flop is level triggered.
- d) Both latch and flip-flop are level triggered.

**46. In a schottky TTL gate, the Schottky diode**

- a) increases the propagation delay
- b) increases the power consumption
- c) prevents saturation of the output transistor
- d) keeps the transistor in cutoff region

**47. For which one of the following ultraviolet light is used to erase the stored contents**

- a) PROM
- b) EPROM
- c) EEPROM
- d) PLA

**48. Which one of the following is NOT a synchronous counter**

- a) Johnson counter
- b) Ring counter
- c) Ripple counter

d) Up-down counter

**49. In 8085 microprocessor, the accumulator is a**

- a) 4 bit register
- b) 8 bit register
- c) 16 bit register
- d) 32 bit register

**50. In the register indirect addressing mode of 8085 microprocessor, data is stored a) at the address contained in the register pair**

- b) in the register pair
- c) in the accumulator
- d) in a fixed location of the memory

**51. The output  $w[n]$  of the system shown in given figure is**

- a)  $x[n]$
- b)  $x[n-1]$
- c)  $x[n] - x[n-1]$
- d)  $0.5(x[n-1] + x[n])$

**52. Which one of the following is a periodic signal**

- a)  $x(t) = 2 e^{j(t+(\pi/4))}$
- b)  $x[n] = u[n] + u[-n]$
- c)  $x[n] = \sum \{ \delta[n-4k] - \delta[n-1-4k] \}$  where  $k = -\infty$  to  $\infty$
- d)  $x(t) = e^{(-1+j)t}$

**53. If the input-output relation of a system is  $y(t) = \int x(t) dt$  where  $t = -\infty$  to  $2t$**

- a) linear, time-invariant and unstable
- b) linear, non-causal and unstable

- c) linear, causal and time invariant
- d) non-causal, time invariant and unstable

**54. Which one of the can be the magnitude of the transfer function  $|H(j\omega)|$  of a causal system**

**55. Consider the function  $H(j\omega) = H_1(\omega) + jH_2(\omega)$ , where  $H_1(\omega)$  is an odd function and  $H_2(\omega)$  is an even function. The inverse Fourier transform of  $H(j\omega)$  is**

- a) a real and odd function b) a complex function
- c) a purely imaginary function
- d) a purely imaginary and odd function

**56. The laplace transform of given signal is**

- a)  $-A((1-e^{cs})/s)$
- b)  $A((1-e^{cs})/s)$
- c)  $A((1-e^{-cs})/s)$
- d)  $-A((1-e^{-cs})/s)$

**57. If  $X(z)$  is the z-transform of  $x[n] = (1/2)^{|n|}$ , the ROC of  $X(z)$  is**

- a)  $|z| > 2$
- b)  $|z| < 2$
- c)  $0.5 < |z| < 2$
- d) the entire z-plane

**58. In a linear phase system,  $\tau_g$  the group delay and  $\tau_p$  the phase delay are**

- a) constant and equal to each other
- b)  $\tau_g$  is a constant and  $\tau_p$  is proportional to  $\omega$
- c) a constant and  $\tau_g$  is proportional to  $\omega$
- d)  $\tau_g$  is proportional to  $\omega$  and  $\tau_p$  is proportional to  $\omega$

**59. A signal  $m(t)$ , band-limited to a maximum frequency of 20 kHz is sampled at a frequency  $f_s$  kHz to generate  $s(t)$ . An ideal low pass filter having cut-off frequency 37 kHz is used to reconstruct  $m(t)$  from  $s(t)$ . The maximum value of  $f_s$  required to reconstruct  $m(t)$  without distortion is**

- a) 20 kHz
- b) 40kHz
- c) 57 kHz
- d) 77 kHz

**60. If the signal  $x(t)$  shown in given figure is fed to an LTI system having impulse response  $h(t)$  as shown in given figure, the value of the DC component present in the output  $y(t)$  is**

- a) 1
- b) 2
- c) 3
- d) 4

**91. The electric field component of a uniform plane wave propagating in a lossless magnetic dielectric medium is given by  $E(t,z) = a_x 5 \cos(10^9 t - 20/3 z)$  V/m. If  $\eta_0$  represents the intrinsic impedance of the free space, the corresponding magnetic field component is given by**

- a)  $H(t,z) = a_y \frac{5}{2} \eta_0 \cos(10^9 t - 20/3 z)$  A/m
- b)  $H(t,z) = a_y 10 / \eta_0 \cos(10^9 t - 20/3 z)$  A/m
- c)  $H(t,z) = a_z \frac{5}{2} \eta_0 \cos(10^9 t - 20/3 z)$  A/m
- d)  $H(t,z) = a_z 10 / \eta_0 \cos(10^9 t - 20/3 z)$  A/m

**92. The skin depth of a non-magnetic conducting material at 100 MHz is 0.15 mm. The distance which a plane wave of frequency 10 GHz travels in this material before its amplitude reduces by a factor of  $e^{-1}$  is**

- a) 0.0015 mm
- b) 0.015 mm
- c) 0.15 mm

d) 1.5 mm

**93. A lossless transmission line has a characteristic impedance of 100 ohms and an inductance per unit length of 1  $\mu\text{H}/\text{m}$ . If the line is operated at 1 GHz, the propagation constant  $\beta$  is**

a)  $2\pi$  rad/m

b)  $20\pi/3$  rad/m

c)  $20\pi$  rad/m

d)  $2\pi * 10^5$  rad/m

**94. When a load resistance  $R_L$  is connected to a lossless transmission line of characteristic impedance 75 ohms, it results in a VSWR of 2. The load resistance is**

a) 100 ohms

b)  $75\sqrt{2}$  ohms

c) 120 ohms

d) 150 ohms

95. A two-port network characterized by the S-parameter matrix,  $[S] = \begin{bmatrix} 0.3 & 0.9 \\ 0.9 & 0.2 \end{bmatrix}$  is

a) both reciprocal and lossless

b) reciprocal, but not lossless

c) lossless, but not reciprocal

d) neither reciprocal nor lossless

**96. A lossless air filled rectangular waveguide has internal dimensions of  $a$  cm \*  $b$  cm. If  $a=2b$  and the cutoff frequency of the  $\text{TE}_{02}$  mode is 12 GHz, the cutoff frequency of the dominant mode is**

a) 1 GHz

b) 3 GHz

c) 6 GHz

d) 9 GHz

**97. A Hertzian dipole antenna is placed at the origin of a coordinate system and it is oriented along z-axis. In which one of the following planes the radiation pattern of the antenna has a circular shape?**

a)  $x=0$

b)  $y=0$

c)  $z=0$

d)  $\phi=45$

**98. Which one of the following statements is not true?**

a) Antenna losses are taken into account in calculating its power gain

b) For an antenna which does not dissipate any power, the directive gain and the power gain are equal

c) Directivity of an antenna is the maximum value of its directive gain

d) The directive gain of a Hertzian dipole is same in all direction

**99. The directivity of a half dipole antenna is**

a) 1.0

b) 1.5

c) 1.64

d) 2

**100. Which one of the following is not true for a step index optical fibre?**

a) It can support multiple modes

b) HE<sub>11</sub> mode is its lowest order mode

c) The refractive index of the cladding is higher than that of the core

d) At a given wavelength, single mode operation is possible by proper choice of core diameter, core and cladding refractive indices.