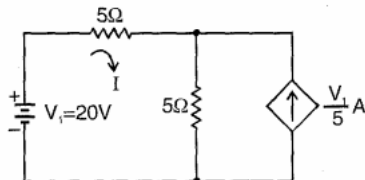


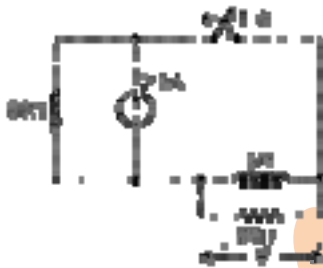
ELECTRONICS & COMMUNICATION ENGINEERING

ONE MARK QUESTIONS

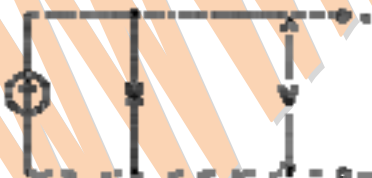
1. The dependent current source shown in the figure



- (a.) delivers 80W
 (b.) absorbs 80W
 (c.) delivers 40W
 (d.) absorbs 40W
2. In the figure, the switch was closed for a long time before opening at $t = 0$. The voltage V_x at $t = 0^+$ is



- (a.) 25V
 (b.) 50V
 (c.) -50V
 (d.) 0V
3. In the figure, silicon diode is carrying a constant current of 1 mA. When the temperature of the diode is 20°C , V_D is found to be 700 mV. If the temperature rises to 40°C , V_D becomes approximately equal to

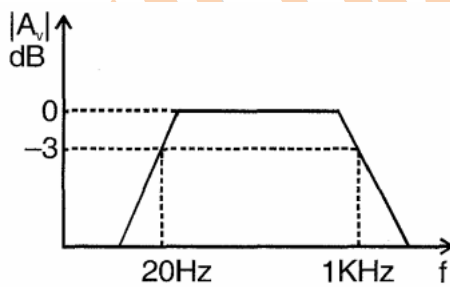


- (a.) 740 mV
 (b.) 660 mV
 (c.) 680 mV
 (d.) 700 mV

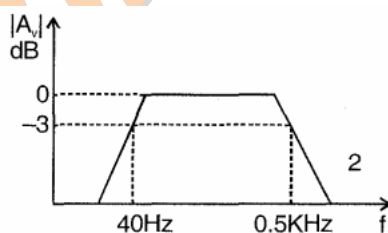
4. If the transistor in the figure is in saturation, then



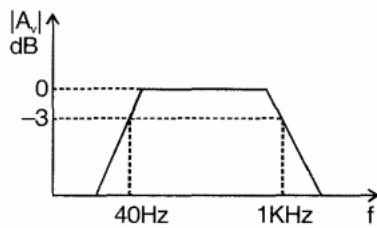
- (a.) I_C is always equal to $\beta_{dc}I_B$
 (b.) I_C is always equal to $-\beta_{dc}I_B$
 (c.) I_C is greater than or equal to $\beta_{dc}I_B$
 (d.) I_C is less than or equal to $\beta_{dc}I_B$
5. In a negative feedback amplifier using voltage-series (i.e. voltage-sampling series mixing) feedback. (R_i and R_o denote the input and output resistances respectively)
- (a.) R_i decreases and R_o decreases
 (b.) R_i decreases and R_o increases
 (c.) R_i increases and R_o decreases
 (d.) R_i increases and R_o increases
6. A 741-type opamp has a gain-bandwidth product of 1 MHz. A non-inverting amplifier using this opamp and having a voltage gain of 20dB will exhibit a -3-dB bandwidth of
- (a.) 50 KHz
 (b.) 100 KHz
 (c.) $\frac{1000}{17}$ KHz
 (d.) $\frac{1000}{7.07}$ KHz
7. Three identical RC-coupled transistor amplifiers are cascaded. If each of the amplifiers has a frequency response as shown in the figure, the overall frequency response is as given in



(a.)



(b.)



(c.)



(d.)



8. -bit 2's complement representation of a decimal number is 1000. The number is

- (a.) +8
- (b.) 0
- (c.) -7
- (d.) -8

9. If the input to the digital circuit (in the figure) consisting of a cascade of 20 XOR-gates is X, then the output Y is equal to



- (a.) 0
- (b.) 1
- (c.) \bar{X}
- (d.) X

10. The number of comparators required in a 3-bit comparator type ADC is

- (a.) 2
- (b.) 3
- (c.) 7
- (d.) 8

11. Convolution of $x(t+5)$ with impulse function $\delta(t-7)$ is equal to

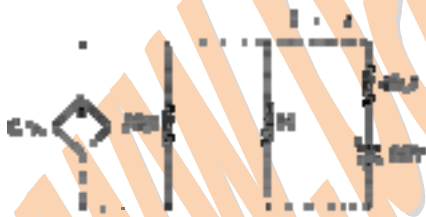
- (a.) $x(t - 12)$
 (b.) $x(t + 12)$
 (c.) $x(t - 2)$
 (d.) $x(t + 2)$
12. Which of the following cannot be the Fourier series expansion of a periodic signal?
 (a.) $x(t) = 2\cos t + 3\cos 3t$
 (b.) $x(t) = 2\cos \pi t + 7\cos t$
 (c.) $x(t) = \cos t + 0.5$
 (d.) $x(t) = 2\cos 1.5\pi t + \sin 3.5\pi t$
13. The Fourier transform $F\{e^{-1}u(t)\}$ is equal to $\frac{1}{1 + j2\pi f}$. Therefore, $F\left\{\frac{1}{1 + j2\pi t}\right\}$ is
 (a.) $e^f u(f)$
 (b.) $e^{-f} u(f)$
 (c.) $e^f u(-f)$
 (d.) $e^{-f} u(-f)$
14. A linear phase channel with phase delay T_p and group delay T_g must have
 (f denotes frequency)
 (a.) $T_p = T_g = \text{constant}$
 (b.) $T_p \propto f$ and $T_g \propto f$
 (c.) $T_p = \text{constant}$ and $T_g \propto f$
 (d.) $T_p \propto f$ and $t_g = \text{constant}$
15. Consider a system with the transfer function $G(s) = \frac{s+6}{Ks^2 + s+6}$. Its damping ratio will be 0.5 when the value of k is
 (a.) $2/6$
 (b.) 3
 (c.) $1/6$
 (d.) 6
16. Which of the following points is NOT on the root locus of a system with the open-loop transfer function $G(s)H(s) = \frac{k}{s(s+1)(s+3)}$
 (a.) $s = -j\sqrt{3}$
 (b.) $s = -1.5$
 (c.) $s = -3$
 (d.) $s = -\infty$

17. The phase margin of a system with the open-loop transfer function $G(s)H(s) = \frac{(1-s)}{(1+s)(2+s)}$
- (a.) 0°
(b.) 63.4°
(c.) 90°
(d.) ∞
18. The transfer function $Y(s)/U(s)$ of a system described by the state equations $\dot{x}(t) = -2x(t) + 2u(t)$ and $y(t) = 0.5x(t)$ is
- (a.) $0.5/(s-2)$
(b.) $1/(s-2)$
(c.) $0.5/(s+2)$
(d.) $1/(s+2)$
19. A 1 MHz sinusoidal carrier is amplitude modulated by a symmetrical square wave of period 100 μ sec. Which of the following frequencies will NOT be present in the modulated signal?
- (a.) 990 KHz
(b.) 1010 KHz
(c.) 1020 KHz
(d.) 1030 KHz
20. Consider a sample signal $y(t) = 5 \times 10^{-6} x(t) \sum_{n=-\infty}^{+\infty} \delta(t - nT_s)$ where $x(t) = 10 \cos(8\pi \times 10^3)t$ and $T_s = 100 \mu$ sec. Which $y(t)$ is passed through an ideal low pass filter with a cutoff frequency of 5 KHz, the output of the filter is
- (a.) $5 \times 10^{-6} \cos(8\pi \times 10^3)t$
(b.) $5 \times 10^{-5} \cos(8\pi \times 10^3)t$
(c.) $5 \times 10^{-1} \cos(8\pi \times 10^3)t$
(d.) $10 \cos(8\pi \times 10^3)t$
21. For a bit-rate of 8 Kbps, the best possible values of the transmitted frequencies in a coherent binary FSK system are
- (a.) 16 KHz and 20 KHz
(b.) 20 KHz and 32 KHz
(c.) 20 KHz and 40 KHz
(d.) 32 KHz and 40 KHz
22. The line-of-sight communication requires the transmit and receive antennas to face each other. If the transmit antenna is vertically polarized, for best reception the receiver antenna should be
- (a.) horizontally polarized

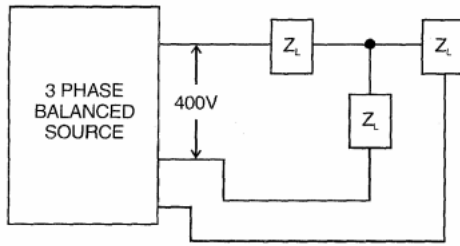
- (b.)vertically polarized
 (c.) at 450 with respect to horizontal polarization
 (d.)at 45° with respect to vertical polarization
23. The VSWR can have any value between
 (a.)0 and 1
 (b.)-1 and +1
 (c.)0 and ∞
 (d.)1 and ∞
24. In an impedance Smith chart, a clockwise movement along a constant resistance circle gives rise to
 (a.) a decrease in the value of reactance
 (b.)an increase in the value of reactance
 (c.) no change in the reactance value
 (d.)no change in the impedance value
25. The phase velocity for the TE₁₀ -mode in an air-filled rectangular waveguide is
 (a.) less than c
 (b.)equal to c
 (c.) greater than c
 (d.)none of the above
 (c is the velocity of plane waves in free space)

TWO MARKS QUESTIONS

26. In the network of the figure, the maximum power is delivered to RL if its value is



- (a.) 16Ω
 (b.) $\frac{40}{3}$ Ω
 (c.) 60Ω
 (d.) 20Ω
27. If the 3-phase balanced source in the figure delivers 1500W at a leading power factor 0.844, then the value of Z_L (in ohm) is approximately



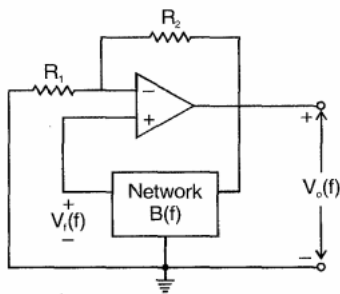
- (a.) $90 \angle 32.44^\circ$
 (b.) $80 \angle 32.44^\circ$
 (c.) $80 \angle -32.44^\circ$
 (d.) $90 \angle -32.44^\circ$

28. An amplifier using an opamp with a slew-rate $SR=1 \text{ V}/\mu\text{sec}$ has a gain of 40dB. If this amplifier has to faithfully amplify sinusoidal signals from dc to 20 KHz without introducing any slew-rate induced distortion, then the input signal level must not exceed.

- (a.) 795 mV
 (b.) 395 mV
 (c.) 79.5 mV
 (d.) 39.5 mV

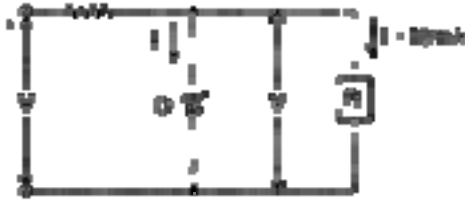
29. The circuit in the figure employs positive feedback and is intended to generate sinusoidal oscillation.

If at a frequency f_0 , $B(f) = \Delta \frac{V_f(f)}{V_o(f)} = \frac{1}{6} \angle 0^\circ$, then to sustain oscillation at this frequency



- (a.) $R_2 = 5R_1$
 (b.) $R_2 = 6R_1$
 (c.) $R_2 = \frac{R_1}{6}$
 (d.) $R_2 = \frac{R_1}{5}$

30. A zener diode regulator in the figure is to be designed to meet the specifications: $I_L = 10\text{mA}$, $V_0 = 10\text{V}$ and V_{in} varies from 30V to 50V. The zener diode has $V_z = 10 \text{ V}$ and I_{zk} (knee current) = 1 mA. For satisfactory operation



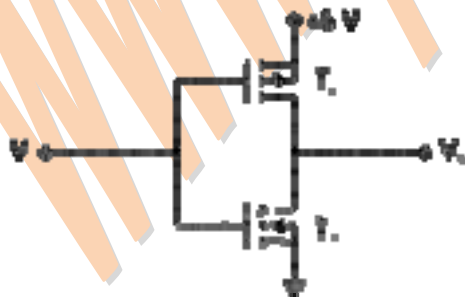
- (a.) $R \leq 1800 \Omega$
- (b.) $2000 \Omega \leq R \leq 2200 \Omega$
- (c.) $3700 \Omega \leq R \leq 4000 \Omega$
- (d.) $R > 4000 \Omega$

31. The voltage gain $A_v = \frac{v_o}{v_i}$ of the JFET amplifier shown in the figure is



$I_{DSS} = 10 \text{ mA}$ $V_p = -5 \text{ V}$
(Assume C_1 , C_2 , and C_s to be very large)

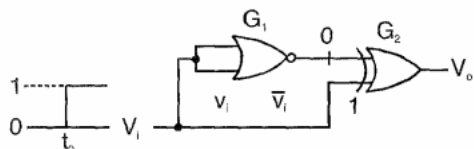
- (a.) +18
 - (b.) -18
 - (c.) 6+
 - (d.) -6
32. Consider the following statements in connection with the CMOS inverter in the figure, where both the MOSFETs are of enhancement type and both have a thresh old voltage of 2V.
- Statement 1: T_1 conducts when $V_i \geq 0 \text{ V}$.
- Statement 2 : T_1 is always in saturation when $V_0 = 0 \text{ V}$.



Which of the following is correct?

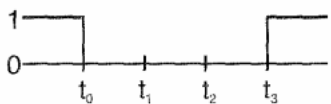
- (a.) Only Statement 1 is TRUE
- (b.) Only Statement 2 is TRUE
- (c.) Both the statements are TRUE
- (d.) Both the statements are FALSE

33. The gates G_1 and G_2 in the figure have propagation delays of 10 nsec and 20 nsec respectively. if the input V_i makes an abrupt change from logic 0 to 1 at time $t = t_0$. then the output waveform V_o is

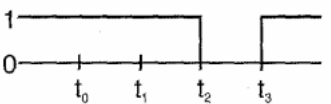


$y = AB$

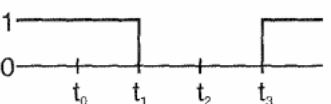
(a.)



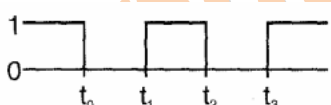
(b.)



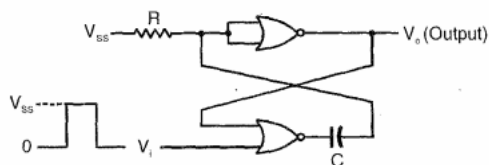
(c.)



(d.)



34. The circuit in the figure has two CMOS NOR-gates. This circuit functions as a:



- (a.) flip-flop
- (b.) Schmitt trigger
- (c.) monostable multivibrator
- (d.) astable multivibrator

35. If the input X_3, X_2, X_1, X_0 to the ROM in the figure are 8-4-2-1 BCD numbers, then the outputs Y_3, Y_2, Y_1, Y_0 are



- (a.) gray code numbers
- (b.) 2-4-2-1 BCD numbers
- (c.) excess-3 code numbers
- (d.) none of the above

36. The Laplace transform of a continuous-time signal $x(t)$ is $X(s) = \frac{5-s}{s^2-s-2}$. If the Fourier transform of this signal exists, then $x(t)$ is

- (a.) $e^{2t}u(t) - 2e^{-t}u(t)$
- (b.) $-e^{2t}u(-t) + 2e^t u(t)$
- (c.) $-e^{2t}u(-t) - 2e^{-t}u(t)$
- (d.) $e^{2t}u(-t) - 2e^{-t}u(t)$

37. If the impulse response of a discrete-time system is $h[n] = -5^n u[-n-1]$, then the system function $H(z)$ is equal to

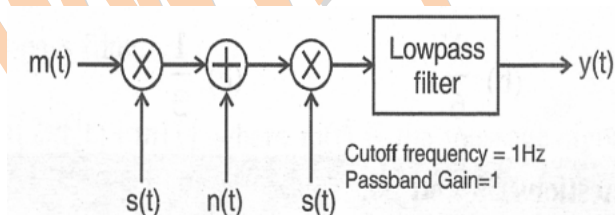
- (a.) $\frac{-z}{z-5}$ and the system is stable
- (b.) $\frac{z}{z-5}$ and the system is stable
- (c.) $\frac{-z}{z-5}$ and the system is unstable
- (d.) $\frac{z}{z-5}$ and the system is unstable

38. The system shown in the figure remains stable when



- (a.) $k < -1$
- (b.) $-1 < k < 1$

- (c.) $1 < k < 3$
 (d.) $k < -3$
39. The transfer function of a system is $G(s) = \frac{100}{(s+1)(s+100)}$. For a unit-step input to the system the approximate settling time for 2% criterion is
 (a.) 100 sec
 (b.) 4 sec
 (c.) 1 sec
 (d.) 0.01 sec
40. The characteristic polynomial of a system is $q(s) = 2s^5 + s^4 + 4s^3 + 2s^2 + 2s + 1$. The system is
 (a.) Stable
 (b.) Marginally stable
 (c.) Unstable
 (d.) oscillatory
41. The system with the open loop transfer function $G(s)H(s) = \frac{1}{s(s^2 + s + 1)}$ has a gain margin of
 (a.) -6 dB
 (b.) 0 dB
 (c.) 3.5 dB
 (d.) 6 dB
42. An angle-modulated signal is given by
 $s(t) = \cos 2\pi(2 \times 10^6 t + 30 \sin 150t + 40 \cos 150t)$
 The maximum frequency and phase deviations of $s(t)$ are
 (a.) 10.5 KHz, 140π rad
 (b.) 6 KHz, 80π rad
 (c.) 10.5 KHz, 100π rad
 (d.) 7.5 KHz, 100π rad
43. In the Figure $m(t) = \frac{2 \sin 2\pi t}{t}$, $s(t) = \cos 200\pi t$ and $n(t) = \frac{\sin 199\pi t}{t}$. The output $y(t)$ will be



- (a.) $\frac{\sin 2\pi t}{t}$

(b.) $\frac{\sin 2\pi t}{t} + \frac{\sin \pi t}{t} \cos 3\pi t$

(c.) $\frac{\sin 2\pi t}{t} + \frac{\sin 0.5\pi t}{t} \cos 1.5\pi t$

(d.) $\frac{\sin 2\pi t}{t} + \frac{\sin \pi t}{t} \cos 0.75\pi t$

44. A signal $x(t) = 100 \cos(24\pi \times 10^3)t$ is ideally sampled with a sampling period of 50μ sec and then passed through an ideal low pass filter with cutoff frequency of 15 KHz. Which of the following frequencies is/are present at the filter output?

(a.) 12 KHz only

(b.) 8 KHz only

(c.) 12 KHz and 9 KHz

(d.) 12 KHz and 8 KHz

45. If the variance σ_x^2 of $d(n) = x(n) - x(n-1)$ is one-tenth the variance σ_x^2 of a stationary zero-mean discrete-time signal $x(n)$, then the normalized autocorrelation function $R_{xx}(k)/\sigma_x^2$ at $k=1$ is

(a.) 0.95

(b.) 0.90

(c.) 0.10

(d.) 0.05

46. A plane wave is characterized by $\vec{E} = \left(0.5 \hat{x} + \hat{y} e^{j\pi/2} \right) e^{j\omega t - jkz}$.

This wave is

(a.) linearly polarized

(b.) circularly polarized

(c.) elliptically polarized

(d.) unpolarized

47. Distilled water at 25°C is characterized by $\sigma = 1.7 \times 10^{-4}$ mho/m and $\epsilon = 78\epsilon_0$ at a frequency of 3 GHz. Its loss tangent $\tan \delta$ is

(a.) 1.3×10^{-5} (b.) 1.3×10^{-3} (c.) $1.7 \times 10^{-4} / 78$ (d.) $1.7 \times 10^{-4} / (78\epsilon_0)$

($\epsilon_0 = 10^{-9} / (36\pi) \text{F/m}$)

48. The electric field on the surface of a perfect conductor is 2 V/m. The conductor is immersed in water with $\epsilon = 80\epsilon_0$. The surface charge density on the conductor is

(a.) 0C/m^2 (b.) 2C/m^2

- (c.) $1.8 \times 10^{-11} / \text{C/m}^2$
(d.) $1.41 \times 10^{-9} / \text{C/m}^2$
($\epsilon_0 = 10^{-9} / (36\pi) \text{ F/m}$)

49. A person with a receiver is 5 Km away from the transmitter. What is the distance that this person must move further to detect a 3-dB decrease in signal strength?
- (a.) 942 m
(b.) 2070 m
(c.) 4978 m
(d.) 5320 m
50. Consider the following assembly language program.

```
                MVI        B, 87H
                MOV        A, B
START:          JMP        NEXT
                MVI        B, 00H
                XRA        B
                OUT        PORT1
                HLT
NEXT:           XRA        B
                JP         START
                OUT        PORT 2
                HLT
```

The execution of the above program in an 8085 microprocessor will result in

- (a.) an output 87H at PORT 1
(b.) an output of 87H at PORT2
(c.) Infinite looping of the program execution with accumulator data remaining at 00H.
(d.) infinite looping of the program execution with accumulator data alternating between 00H and 87H