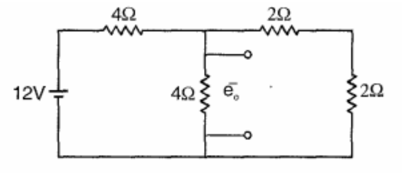
ONE MARK QUESTIONS

1. The Voltage e_0 in the figure is



(a.) 2 V

(b.) $\frac{4}{2}$ V

(c.) 4V

(d.) 8V

2. Each branch of a Delta circuit has impedance $\sqrt{3}Z$, then each branch of the equivalent Wye circuit has impedance.

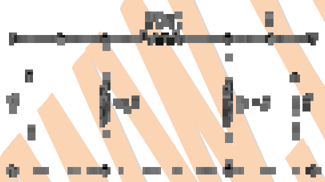
(a.) $\frac{Z}{\sqrt{3}}$

(b.) 3Z

(c.) $3\sqrt{3Z}$

(d.) $\frac{Z}{3}$

3. The admittance parameter Y_{12} in the 2-port network in Figure is



(a.) -0.2 mho

(b.) 0.1 mho

(c.) -0.05 mho

(d.) 0.05 mho

4. MOSFET can be used as a

(a.) current controlled capacitor

(b.) voltage controlled capacitor

(c.) current controlled inductor

(d.) voltage controlled inductor

5. The effective channel length of a MOSFET in saturation decreases with increase in

(a.) gate voltage

(b.) drain voltage

(c.) source voltage

(d.) body voltage

6. The current gain of a BJT is

(a.) $g_m r_0$

(b.) $\frac{g_m}{r_0}$

(c.) $g_m r_\pi$

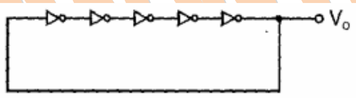
(d.) $\frac{g_m}{r_\pi}$

7. The ideal OP-AMP has the following characteristics.
(a.) $R_i = \infty$, $A = \infty$, $R = 0$
(b.) $R_i = \infty$, $A = \infty$, $R_0 = 0$
(c.) $R_i = \infty$, $A = \infty$, $R_0 = \infty$
(d.) $R_i = 0$, $A = \infty$, $R_0 = \infty$

8. Consider the following two statements:
Statement 1:
A stable multivibrator can be used for generating square wave.
Statement 2:
Bistable multivibrator can be used for storing binary information.
(a.) Only statement 1 is correct
(b.) Only statement 2 is correct
(c.) Both the statements 1 and 2 are correct
(d.) Both the statements 1 and 2 are incorrect

9. The 2's complement representation of -17 is
(a.) 101110
(b.) 101111
(c.) 111110
(d.) 110001

10. For the ring oscillator shown in the figure, the propagation delay of each inverter is 100 pico sec. What is the fundamental frequency of the oscillator output?



(a.) 10 MHz
(b.) 100 MHz
(c.) 1 GHz
(d.) 2 GHz

11. An 8085 microprocessor based system uses a 4K x 8bit RAM whose starting address is AAOO H. The address of the last byte in this RAM is
(a.) OFFF H
(b.) 1000 H
(c.) B9FF H

(d.)BAOO H

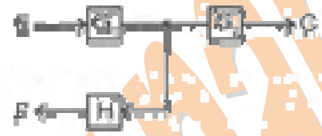
12. The transfer function of a system is given by $H(s)=\frac{1}{s^2(s-2)}$. The impulse response of the system is
(* denotes convolution, and U(t) is unit step function)
(a.) $(t^2 * e^{-2t})U(t)$
(b.) $(t * e^{2t})U(t)$
(c.) $(te^{-2t})U(t)$
(d.) $(te^{-2t})U(t)$

13. The region of convergence of the z-transform of a unit step function is
(a.) |z| > 1
(b.) |z| < 1
(c.) (Real part of z) > 0
(d.) (Real part of z) < 0

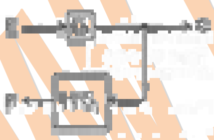
14. Let δ(t) denote the delta function. The value of the integral $\int_{-\infty}^{\infty}\delta(t)\cos\left(\frac{3t}{2}\right)dt$ is
(a.) 1
(b.) -1
(c.) 0
(d.) $\frac{\pi}{2}$

15. If a signal f(t) has energy E, the energy of the signal f(2t) is equal to
(a.) E
(b.) $\frac{E}{2}$
(c.) 2E
(d.) 4E

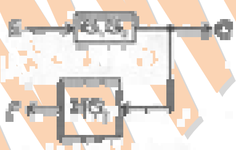
16. The equivalent of the block diagram in the figure is given is



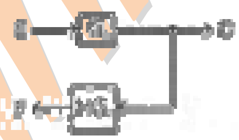
(a.)



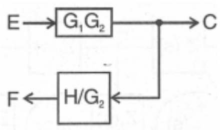
(b.)



(c.)



(d.)



17. If the characteristic equation of a closed-loop system is $s^2 + 2s + 2 = 0$, then the system is

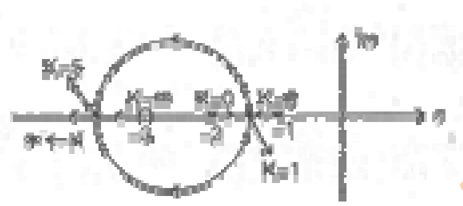
(a.) overdamped

(b.) critically damped

(c.) underdamped

(d.) undamped

18. The root-locus diagram for a closed-loop feedback system is shown in the figure. The system is over damped.



(a.) Only if $0 \leq K \leq 1$

(b.) Only if $1 < K < 5$

(c.) only if $K > 5$

(d.) if $0 \leq K < 1$ or $K > 5$

19. The Nyquist plot for the open-loop transfer function G (s) of a unity negative feedback system is shown in the figure, if G (s) has no pole in the right-half of s-plane, the number of roots of the system characteristic equation in the right-half of s-plane is

(a.) 0

(b.) 1

(c.) 2

(d.) 3

20. A band limited9 signal is sampled at the Nyquist rate. The signal can be recovered by passing the samples through

(a.) an RC filter

(b.) an envelope detector

(c.) a PLL

(d.) an ideal low-pass filter with the appropriate bandwidth

21. The PDF of a Gaussian random variable X is given by $P_x(x) = \frac{1}{3\sqrt{2\pi}} e^{\frac{-(x-4)^2}{18}}$. The probability of the event {X = 4} is

(a.) $\frac{1}{2}$

(b.) $\frac{1}{3\sqrt{2\pi}}$

(c.) 0

(d.) $\frac{1}{4}$

22. A transmission line is distortionless if

(a.) RL = $\frac{1}{GC}$

(b.) RL = GC

(c.) LG = GC

(d.) RG = LC

23. If a plane electromagnetic wave satisfies the equation $\frac{\partial^2 E_x}{\partial z^2} = c^2 \frac{\partial^2 E_x}{\partial t^2}$, the wave propagates in the

(a.) x-direction

(b.) z-direction

(c.) y-direction

(d.) xy plane at an angle of 45° between the x and z directions

24. The phase velocity of waves propagating in a hollow metal waveguide is

(a.) greater than the velocity of light in free space

(b.) less than the velocity of light in free space

(c.) equal to the velocity of light in free space

(d.) equal to the group velocity

25. The dominant mode in a rectangular waveguide is TE_{10}, because this mode has

(a.) no attenuation

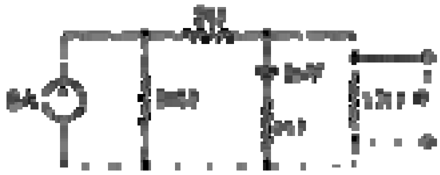
(b.) no cut-off

(c.) no magnetic field component

(d.) the highest cut-off wavelength

TWO MARKS QUESTIONS

26. The voltage e_0 in the figure is



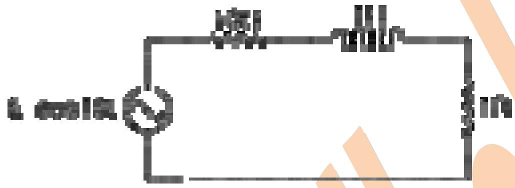
(a.) 48 V

(b.) 24 V

(c.) 36 V

(d.) 28 V

27. In the figure, the value of the load resistor R which maximizes the power delivered to it is



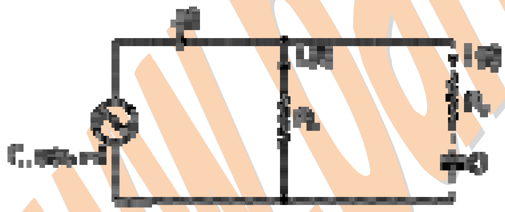
(a.) 14.14 Ω

(b.) 10 Ω

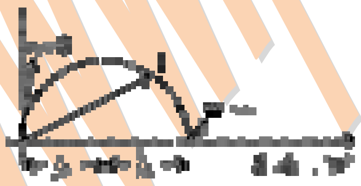
(c.) 200 Ω

(d.) 28.28 Ω

28. When the angular frequency ω in the figure is varied from 0 to ∞, the locus of the current phasor I_2 is given by

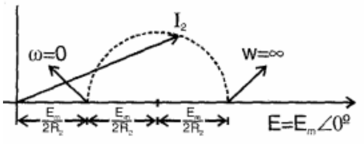


(a.)

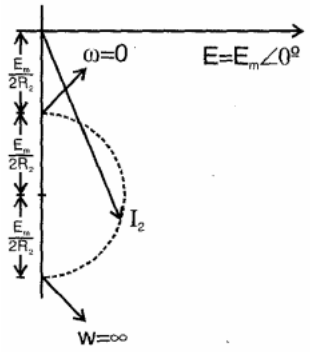


(b.)

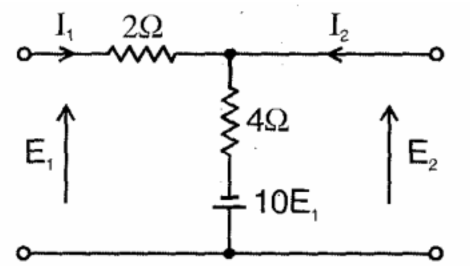
(c.)



(d.)



29. The Z parameters Z_{11} and Z_{21} for the 2-port network in the figure are



(a.) $Z_{11} = -\frac{6}{11}\Omega\,;\, Z_{21} = \infty\frac{6}{11}\Omega;$

(b.) $Z_{11} = \frac{6}{11}\Omega\,;\, Z_{21} = \frac{4}{11}\Omega;$

(c.) $Z_{11} = \frac{6}{11}\Omega\,;\, Z_{21} = \frac{16}{11}\Omega;$

(d.) $Z_{11} = \frac{4}{11}\Omega\,;\, Z_{21} = \frac{4}{11}\Omega;$

30. An npn BJT has g_m = 38 mA/V, $C_\pi = 10 \times 10^{-14}$ F, and $C_\pi = 4 \times 10^{-13}$ F, and DC current gain $\beta_0 = 90$. For this transistor f_T and f_β are

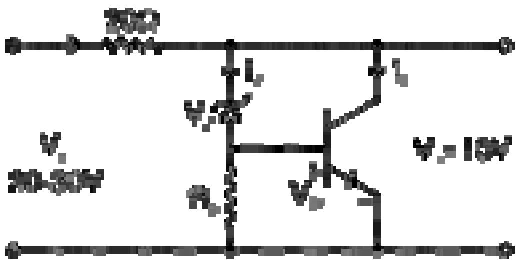
(a.) $f_T = 1.64 \times 10^8$ Hz and $f_\beta = 1.47 \times 10^{10}$ Hz

(b.) $f_T = 1.47 \times 10^{10}$ Hz and $f_\beta = 1.64 \times 10^8$ Hz

(c.) $f_T = 1.33 \times 10^{12}$ Hz and $f_\beta = 1.47 \times 10^{10}$ Hz

(d.) $f_T = 1.47 \times 10^{10}$ Hz and $f_\beta = 1.33 \times 10^{12}$ Hz

31. The transistor shunt regulator shown in the figure has a regulated output voltage of 1OV, when the input varies from 20V to 30V, The relevant parameters for the zener diode and the transistor are: Vz = 9.5, V_{BE} = 0.3V, β = 99. Neglect the current through R_B. Then the maximum power dissipated in the zener diode (P_Z) and the transistor (P_T) are



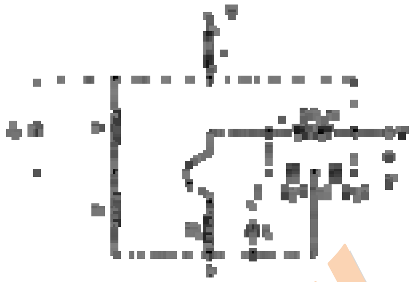
(a.) P_Z = 75mW, P_T = 7.9W

(b.) P_Z = 85mW, P_T =8.9W

(c.) P_Z = 95mW, P_T = 9.9W

(d.) P_Z = 115mW, P_T =11.9W

32. The oscillator circuit shown in the figure is



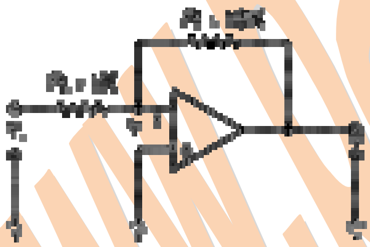
(a.) Hartley oscillator with $f_{oscillation}$ = 79.6MHz

(b.) Colpitts oscillator with $f_{oscillation}$ =50.3 MHz

(c.) Hartley oscillator with $f_{oscillation}$ = 159.2MHz

(d.) Colpitts oscillator with $f_{oscillation}$ = 159.2MHz

33. The inverting OP-AMP shown in the figure has an open loop gain of 100. The closed-loop gain $\frac{v_0}{v_s}$ is



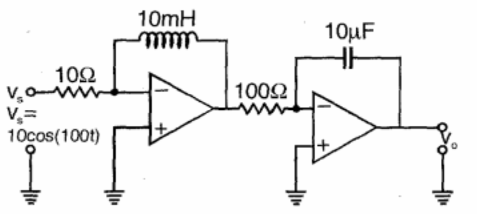
(a.) -8

(b.) -9

(c.) -10

(d.) -11

34. In the figure assume the OP-AMPs to be ideal. The output v_0 of the circuit is:



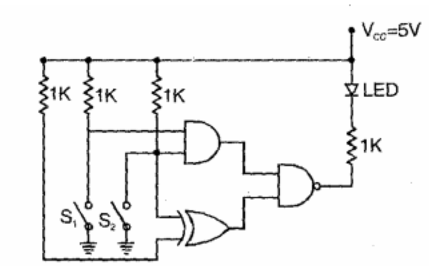
(a.) 10cos(100t)

(b.) $10\int_0^t \cos(100\tau)\,d\tau$

(c.) $10^{-4}\int_0^t \cos(100\tau)\,d\tau$

(d.) $10^{-4}\frac{d}{dt}\cos(100t)$

35. In the figure, the LED



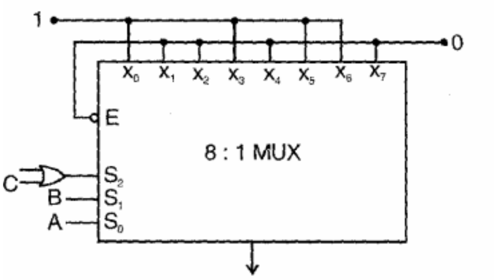
(a.) emits light when both S_1 and S_2 are closed.

(b.) emits light when both S_1 and S_2 are open.

(c.) emits light when only of S_1 and S_2 is closed.

(d.) does not emit light, irrespective of the switch positions.

36. In the TTL circuit in the figure, S_2 and S_0 are select lines and X_7 to X_0 are input lines. S_0 and X_0 are LSBs. The output Y is



(a.) indeterminate

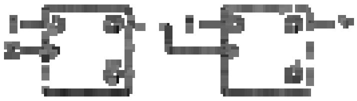
(b.) $A \oplus B$

(c.) $\overline{A \oplus B}$

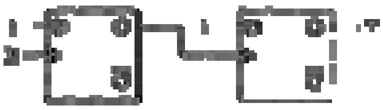
(d.) $\overline{C}\left(\overline{A \oplus B}\right) + C.(A \oplus B)$

37. The digital block in the figure is realized using two positive edge triggered D-flip-flops. Assume that for t < t_0, $Q_1 = Q_2 = 0$. The circuit in the digital block is given by:

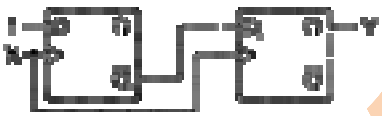
(a.)



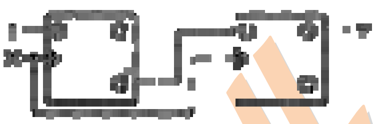
(b.)



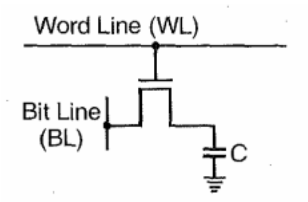
(c.)



(d.)



38. In the DRAM cell in the figure, the V_t of the NMOSFET is 1V. For the following three combinations of WL and BL voltages.



(a.) 5V; 3V; 7V

(b.) 4V; 3V; 4V

(c.) 5V; 5V; 5V

(d.) 4V; 4V; 4V

39. The impulse response functions of four linear systems S1, S2, S3, S4 are given respectively by

$h_1(t)=1$ $\qquad$ $h_2(t)=U(t)$

$h_3(t) = \dfrac{U(t)}{t+1}$ $\qquad$ $h_4(t)= e^{-3t}U(t)$

Where U(t) is the unit step function. Which of these systems is time invariant, causal, and stable?

(a.) S1

(b.) S2

(c.) S3

(d.) S4

40. An electrical system and its signal-flow graph representations are shown in the figure (a) and (b) respectively. The values of G_2 and H, respectively, are

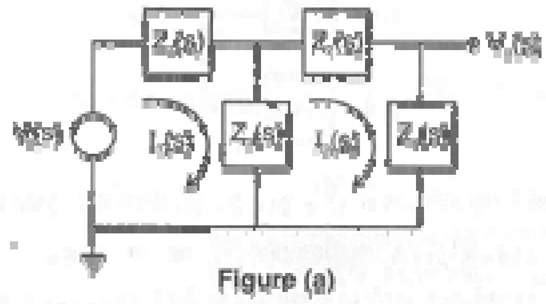


Figure (a)

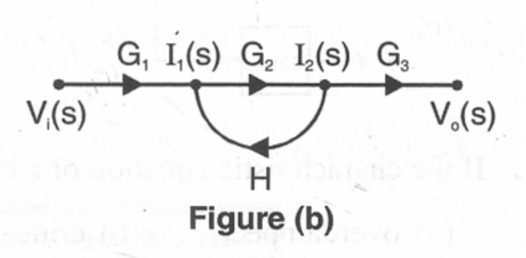


Figure (b)

(a.) $\dfrac{Z_3(s)}{Z_2(s)+Z_3(s)+Z_4(s)}, \dfrac{-Z_3(s)}{Z_1(s)+Z_3(s)}$

(b.) $\dfrac{-Z_3(s)}{Z_2(s)-Z_3(s)+Z_4(s)}, \dfrac{-Z_3(s)}{Z_1(s)+Z_3(s)}$

(c.) $\dfrac{Z_3(s)}{Z_2(s)+Z_3(s)+Z_4(s)}, \dfrac{Z_3(s)}{Z_1(s)+Z_3(s)}$

(d.) $\dfrac{-Z_3(s)}{Z_2(s)-Z_3(s)+Z_4(s)}, \dfrac{Z_3(s)}{Z_1(s)+Z_3(s)}$

41. The open-loop DC gain of a unity negative feedback system with closed-loop transfer function $\dfrac{s+4}{s^2+7s+13}$ is

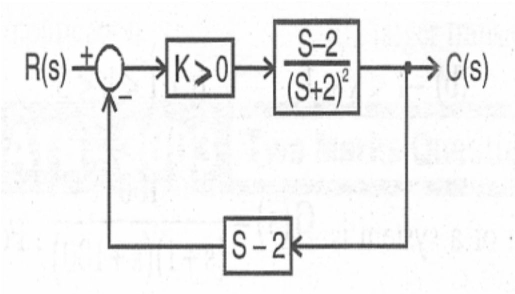
(a.) $\dfrac{4}{13}$

(b.) $\dfrac{4}{9}$

(c.) 4

(d.) 13

42. The feedback control system in the figure is stable.



(a.) For all $K \geq 0$

(b.) Only $K \geq 0$

(c.) Only if $0 \leq K < 1$

(d.) Only if $0 \leq K \leq 1$

43. A video transmission system transmits 625 picture frames per second. Each frame consists of a 400 × 400 pixel grid with 64 intensity levels per pixel. The data rate of the system is

(a.) 16 Mbps

(b.) 100 Mbps

(c.) 600 Mbps

(d.) 6.4 Gbps

44. The Nyquist sampling interval, for the signal Sinc (700t) + Sinc (500t) is

(a.) $\frac{1}{350}$ sec

(b.) $\frac{\pi}{350}$ sec

(c.) $\frac{1}{700}$ sec

(d.) $\frac{\pi}{175}$ sec

45. During transmission over a communication channel, bit errors occur independently with probability p. If a block of n bits is transmitted, the probability of at most one bit error is equal to

(a.) $1 - (1 - p)^n$

(b.) $P + (n — 1) (1 — p)$

(c.) $n p(1 — p)^{n-1}$

(d.) $(1 – p)^n + np(1 - p)^{n-1}$

46. The PSD and the power of a signal g(t) are, respectively, $S_g(\omega)$ and P_g. The PSD and the power of the signal ag(t) are, respectively,

(a.) $a^2S_g(\omega)$ and a^2P_g

(b.) $a^2S_g(\omega)$ and aP_g

(c.) $aS_g(\omega)$ and a^2P_g

(d.) $aS_g(\omega)$ and aP_g

47. A material has conductivity of 10^{-2} mho/m and a relative permittivity of 4. The frequency at which the conduction current in the medium is equal to the displacement current is

(a.) 45 MHz

(b.) 90 MHz

(c.) 450 MHz

(d.) 900 MHz

48. A uniform plane electromagnetic wave incident normally on a plane surface of a dielectric material is reflected with a VSWR of 3. What is the percentage of incident power that is reflected?

(a.) 10%

(b.) 25%

(c.) 50%

(d.) 75%

49. A medium wave radio transmitter operating at a wavelength of 492 m has a tower antenna of height 124m. What is the radiation resistance of the antenna?

(a.) 25 Ω

(b.) 36.5 Ω

(c.) 50 Ω

(d.) 73 Ω

50. In a uniform linear array, four isotropic radiating elements are spaced $\frac{\lambda}{4}$ apart. The progressive phase shift between the elements required for forming the main beam at 60° off the end-fire is:

(a.) $-\pi$ radians

(b.) $-\frac{\pi}{2}$ radians

(c.) $-\frac{\pi}{4}$ radians

(d.) $-\frac{\pi}{8}$ radians