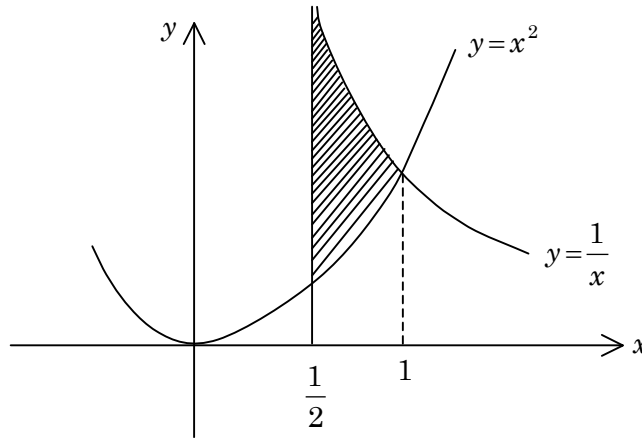




1. Find the area of the region bounded by the curves $y = x^2$, $y = 1/x$ and $x = 1/2$ (see in graphical representative figure)

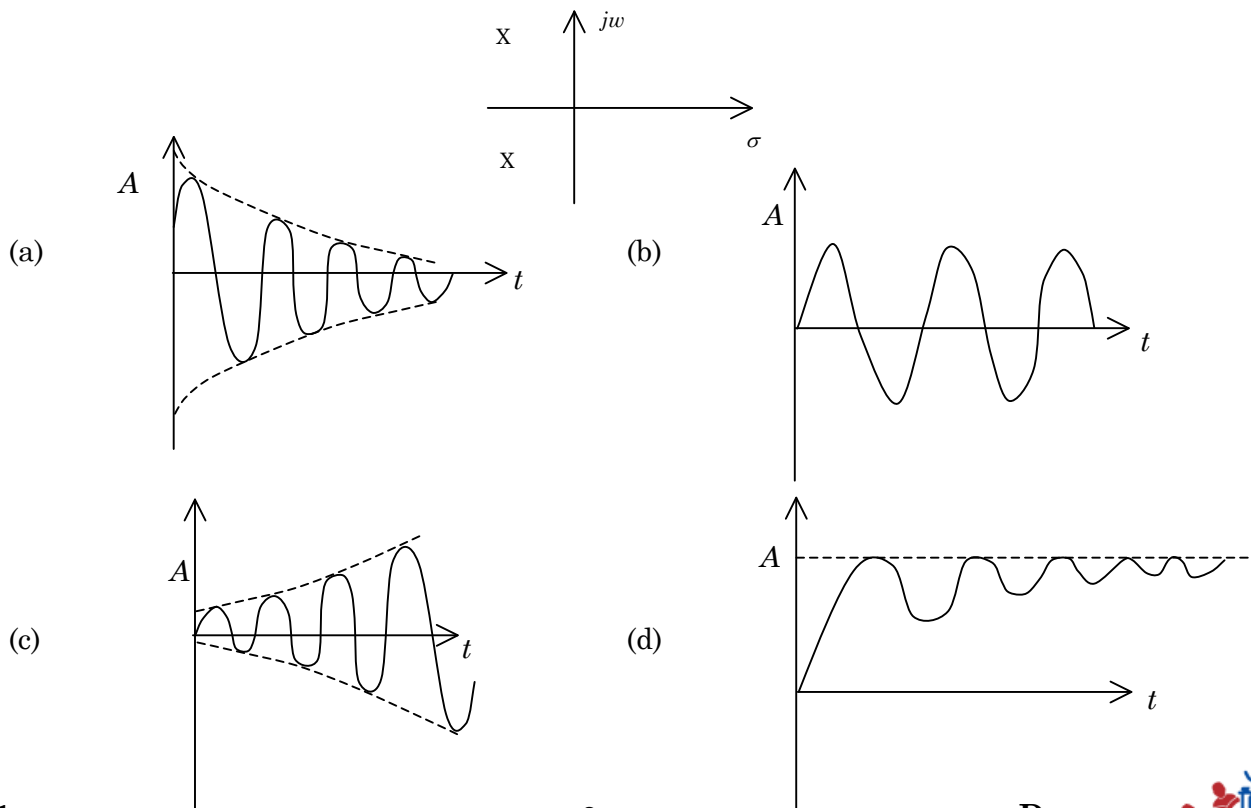


- (a) $\ln 2 - 7/24$ (b) $\ln 2 + 7/24$ (c) $\ln 3 - 5/24$ (d) $\ln 3 + 5/24$

2. Find the Eigen values λ in the system $\begin{bmatrix} 4 & 1 \\ 3 & 2 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \lambda \begin{bmatrix} x \\ y \end{bmatrix}$

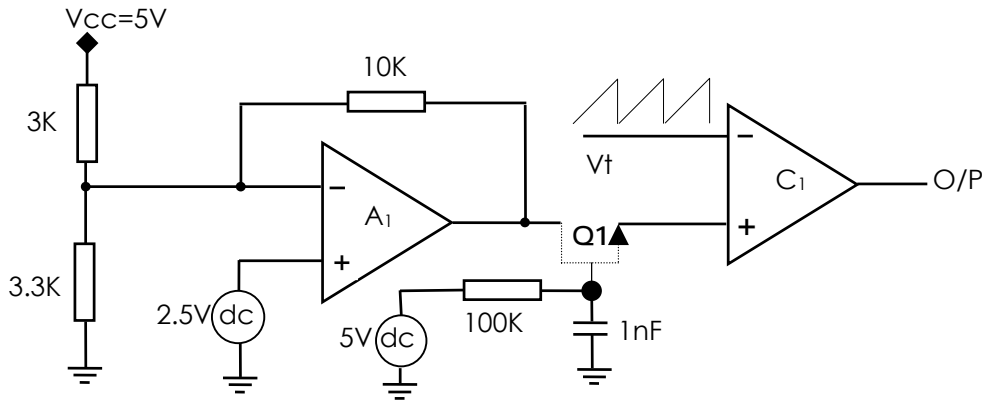
- (a) 1 and 5 (b) 4 and 3 (c) 1 and 2 (d) 2 and 4

3. Find the transient response of a pair of complex poles as given below



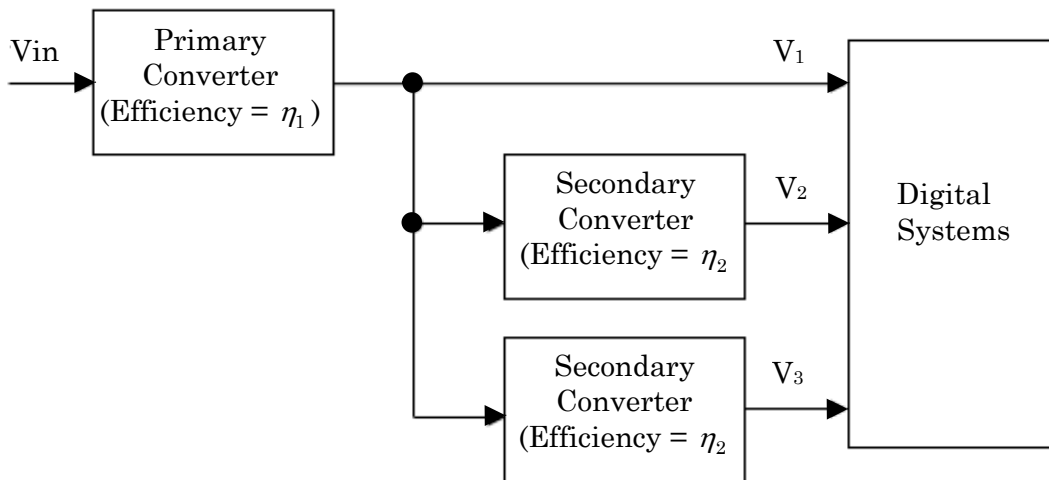


8. The ramp signal ($V_t : 0$ to $5V$) is compared with the Soft-Start Signal provided by N-channel MOSFET (Q_1) for Amplifier (A_1) output. If Q_1 having low threshold voltage of $0.7V$ and negligible ON resistance. What is the duty of output signal of comparator (C_1) after $100 \mu\text{Sec}$?



- (a) 17.4 % (b) 34.8 % (c) 0 % (d) 50 %

9. A High speed digital Subsystem requires three voltages V_1 , V_2 and V_3 with 1:2:1 power ratings respectively. The power supply is designed with the distribute power conversion scheme as shown in the following figure. What is the overall power conversion efficiency?

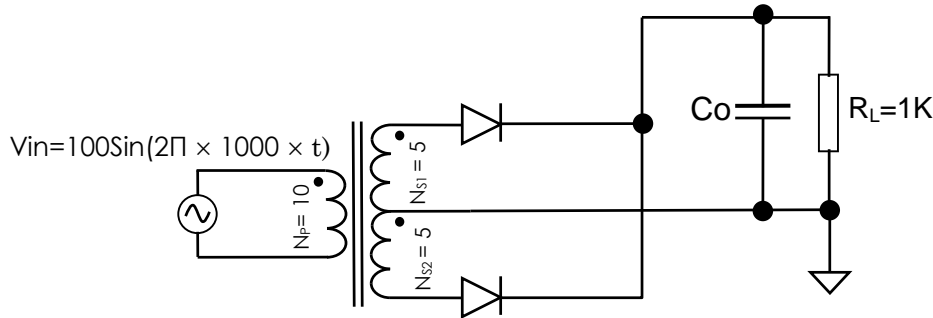


- (a) $\frac{4 \times \eta_1 \times \eta_2 \times \eta_3}{\eta_2 \eta_3 + 2 \times \eta_3 + \eta_2}$ (b) $\frac{\eta_1 \times \eta_2 \times \eta_3}{\eta_2 \eta_3 + 2 \times \eta_3 + \eta_2}$
 (c) $\frac{4 \times \eta_1 \times \eta_2 \times \eta_3}{\eta_2 \eta_3 + \eta_2 + \eta_3}$ (d) $\frac{2 \times \eta_1 \times \eta_2 \times \eta_3}{\eta_2 \eta_3 + \eta_2 + \eta_3}$



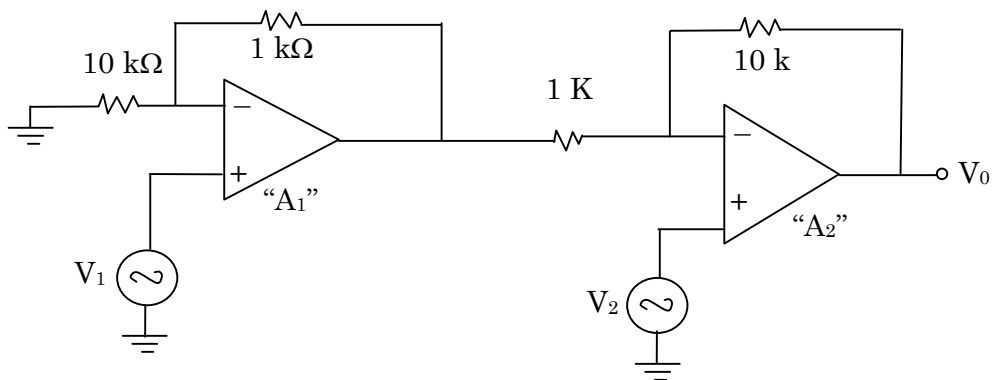
10. If the transformer and diodes in the following circuit are ideal, Find out the value of Capacitor (C_o) provides 5% ripple voltage across R_L .

(Assume that $\sin^{-1}(0.95) \sim 2\pi/5$ in Radians $\ln(0.95) = -0.051$)



- (a) $4.7 \mu F$ (b) $16.7 \mu F$ (c) $8.7 \mu F$ (d) $2.7 \mu F$
11. Relationship between doppler frequency shifts of two radars A and B having 0.1 foot and 0.05 foot wavelengths, approaching the target at 1000 feet per second and 2000 feet per second rate respectively, will be
- (a) Doppler frequency shift of radar A will be one-fourth of doppler frequency shift of radar B
- (b) Doppler frequency shift of radar A will be one-half of doppler frequency shift of radar B
- (c) Doppler frequency shift of radar A will be double of doppler frequency shift of radar B
- (d) Doppler frequency shifts of radar A and radar B will be same
12. A sinusoidal input which can be reproduced in an OP-AMP without any distortion having slew rate of $10\pi \text{ V}/\mu\text{s}$ and 5V peak output amplitude, has the maximum frequency of
- (a) 1KHz. (b) 1MHz. (c) 31.42KHz. (d) 31.42MHz.
13. Which of the following is NOT a characteristic of Schottky Diode?
- (a) Thermionic emission of carriers across Schottky barrier
- (b) Current conduction in Schottky diodes is by majority carriers
- (c) Switching speed of Schottky diodes is less compared to p-n junction diodes
- (d) Schottky diode comprises of Metal-Semiconductor junction

14. A Sensistor exhibits the following characteristics
- Either increase or decrease in resistance value with increase in temperature based on the material type used in the thermistor
 - Always increase in resistance value with increase in temperature
 - Always decrease in resistance value with increase in temperature
 - No change in resistance value with temperature
15. When an electromagnetic wave is incident on an object having surface roughness comparable to the wavelength, then
- Specular reflection occurs
 - Absorption occurs
 - Diffused scattering occurs
 - None of the above
16. For the following circuit, determine the output voltage ' V_0 ' in terms of input voltages V_1 and V_2 , assuming A_1 and A_2 are ideal op-amps



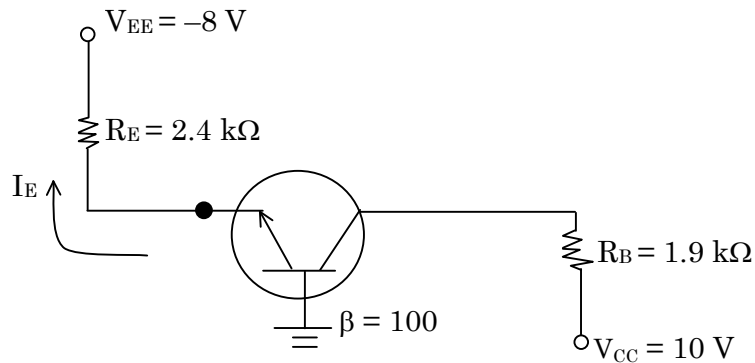
- $11 V_2 - V_1$
 - $V_2 - 11V_1$
 - $11 (V_2 - V_1)$
 - None of the above
17. Dominant mechanism for motion of charge carriers in forward and reverse biased silicon p-n junctions are
- Drift in forward bias, diffusion in reverse bias
 - Diffusion in forward bias, drift in reverse bias
 - Diffusion in both forward and reverse bias
 - Drift in both forward and reverse bias

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18. Which of the following is NOT true about opto-couplers?
- It is a solid state device to isolate two parts of a circuit
 - It can act as an input device or output device but not both
 - Combines a Light Emitting Diode and a Photo Transistor in a single package
 - It prevents electrical noise or voltage transients of one circuit from integrating with other circuit
19. Which of the noise types is dominant in Metal Semiconductor Field Effect Transistor (MESFET) when compared to Bipolar Junction Transistor (BJT)?
- Thermal Noise
 - Shot Noise
 - Flicker Noise
 - All of the above
20. Which factor determines the range resolution of a radar?
- Size of the antenna
 - Bandwidth of the transmitted pulse
 - Power radiated form the antenna
 - Centre frequency of the radar
21. A signal having frequency component from DC-2KHz is to be Pulse code Modulated with a 6 bit Encoder. Minimum carrier bandwidth required is?
- 4KHz.
 - 128KHz.
 - 16KHz.
 - 12KHz.
22. Which of the following is NOT true for Schmitt Trigger?
- Schmitt trigger can be used as Sine-to-Square Wave Converter
 - Schmitt trigger uses OP-AMP in Open Loop Mode
 - Hysteresis exists in Schmitt Trigger
 - All of the above



23. For the silicon transistor shown in the figure below, the value of I_B is?



- (a) $26.47 \mu A$ (b) $52.94 \mu A$ (c) $13.235 \mu A$ (d) $30.11 \mu A$

24. Which one of the following statement is not true for static random access memory (SRAM)


- (a) Static RAM stores data in the form of charge
(b) They have low capacity, but offer high speed
(c) It doesn't require periodic refreshing
(d) They are made up of six CMOS transistor

25. Which of the following statement is not true

- (a) Autocorrelation function and energy spectral density forms a Fourier transform pair
(b) Autocorrelation function of a real valued energy signal is a real valued odd function
(c) The value of autocorrelation function of a power signal at the origin is equal to the average power of the signal
(d) Autocorrelation function is the inverse Fourier transform of power spectral density

26. The Eddy current loss is proportional to the

- (a) Frequency
(b) Square of the frequency
(c) Cube of the frequency
(d) Square root of the frequency

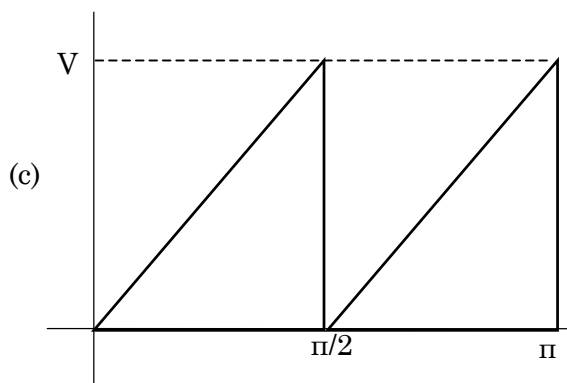
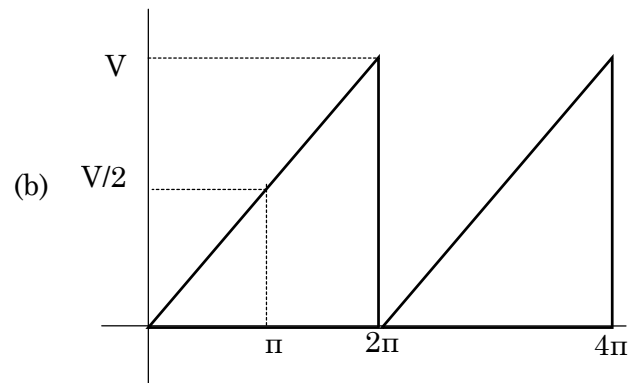
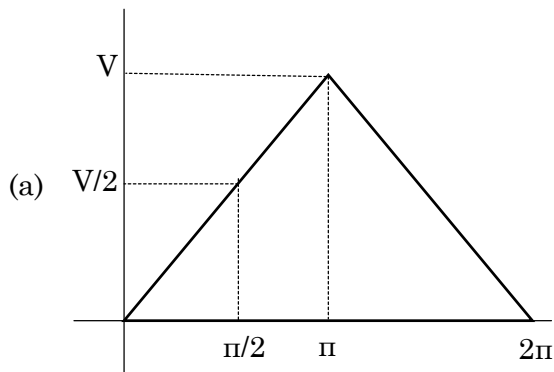
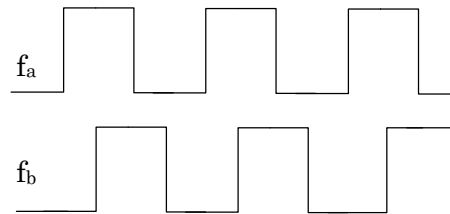
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27. The temperature below which certain materials are antiferromagnetic and above which they are paramagnetic is called
- (a) Weiss temperature (b) Curie temperature
(c) Neel temperature (d) None of the above
28. In metals, the thermal conductivity K and electrical conductivity σ are related as $\frac{K}{\sigma T} = L$.
L is known as
- (a) Lattice constant (b) Lorenz number
(c) Lanevin Function (d) Larmor number
29. In a specimen of ferromagnetic material with saturation magnetization as 8000 Gauss, as the flux density is increased from 0 to 2.5 T, μ_r will
- (a) Increase (b) Decrease
(c) First decrease then increase (d) First increase then decrease
30. The cavity magnetron uses strapping to
- (a) Prevent mode jumping (b) Prevent cathode back-heating
(c) Ensure bunching (d) Improve the phase focussing effect
31. The TWT is sometimes preferred to the magnetron as a radar transmitter output tube because it is
- (a) Capable of a larger duty cycle (b) A more efficient amplifier
(c) More broadband (d) Less noisy
32. One of the reason why conventional vacuum valve tubes not used at microwave frequencies is that their
- (a) Noise increases
(b) It has less transit time
(c) Shunt capacitive reactance become too large
(d) Series induction reactance become too small





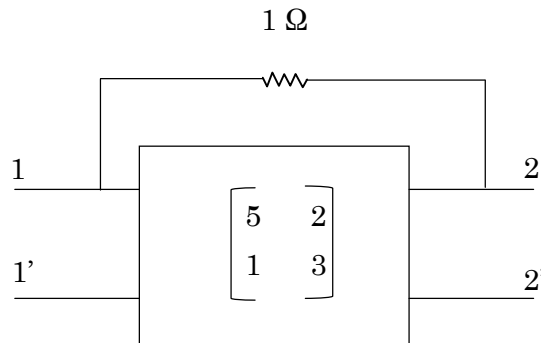
38. Two signals f_a and f_b are given as input to EX-OR to measure phase difference. The average output voltage will be



(d) None of the above



41. Y-parameter of a two port network is shown below. A 1Ω resistor is connected to the network as shown. Find out the Y parameter of the whole network.



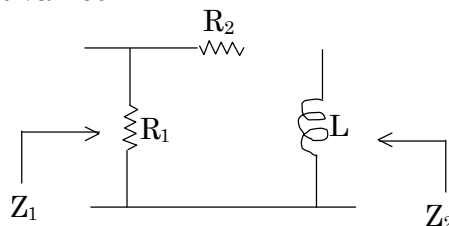
(a) $\begin{bmatrix} 6 & 1 \\ 0 & 4 \end{bmatrix}$

(b) $\begin{bmatrix} 6 & 3 \\ 2 & 4 \end{bmatrix}$

(c) $\begin{bmatrix} 4 & 1 \\ 0 & 2 \end{bmatrix}$

(d) $\begin{bmatrix} 3 & 1 \\ 1 & 2 \end{bmatrix}$

42. For the circuit shown below, $Z_1 = K_1 \times (s+2)/(s+5)$. Find Z_2 , where K_1 and K_2 are constants containing circuit element values



(a) $K_2 \times s/(s + 5)$

(b) $(s + 5)/(s \times K_2)$

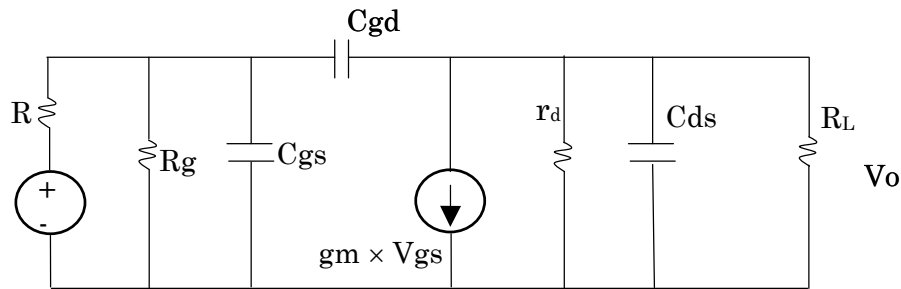
(c) $K_2 \times s/(s + 6)$

(d) $(s + 6)/(s \times K_2)$



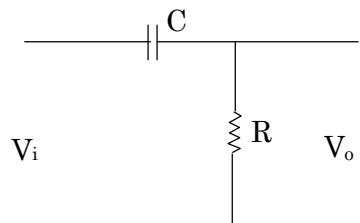
43. Following is the small signal high frequency equivalent circuit of a common source amplifier. V_0/V_i will be of the form

($K, z_1, a_0, a_1, a_2, a_3$ are constants containing circuit elements)



- (a) $K(s - z_1)/(a_0 + a_1s + a_2s^2)$ (b) $K.s/(a_0 + a_1s + a_2s^2 + a_3s^3)$
(c) $K(s - z_1)/(a_0 + a_1s)$ (d) $K/(a_0 + a_1s)$

44. Phase of the transfer function of the following circuit is



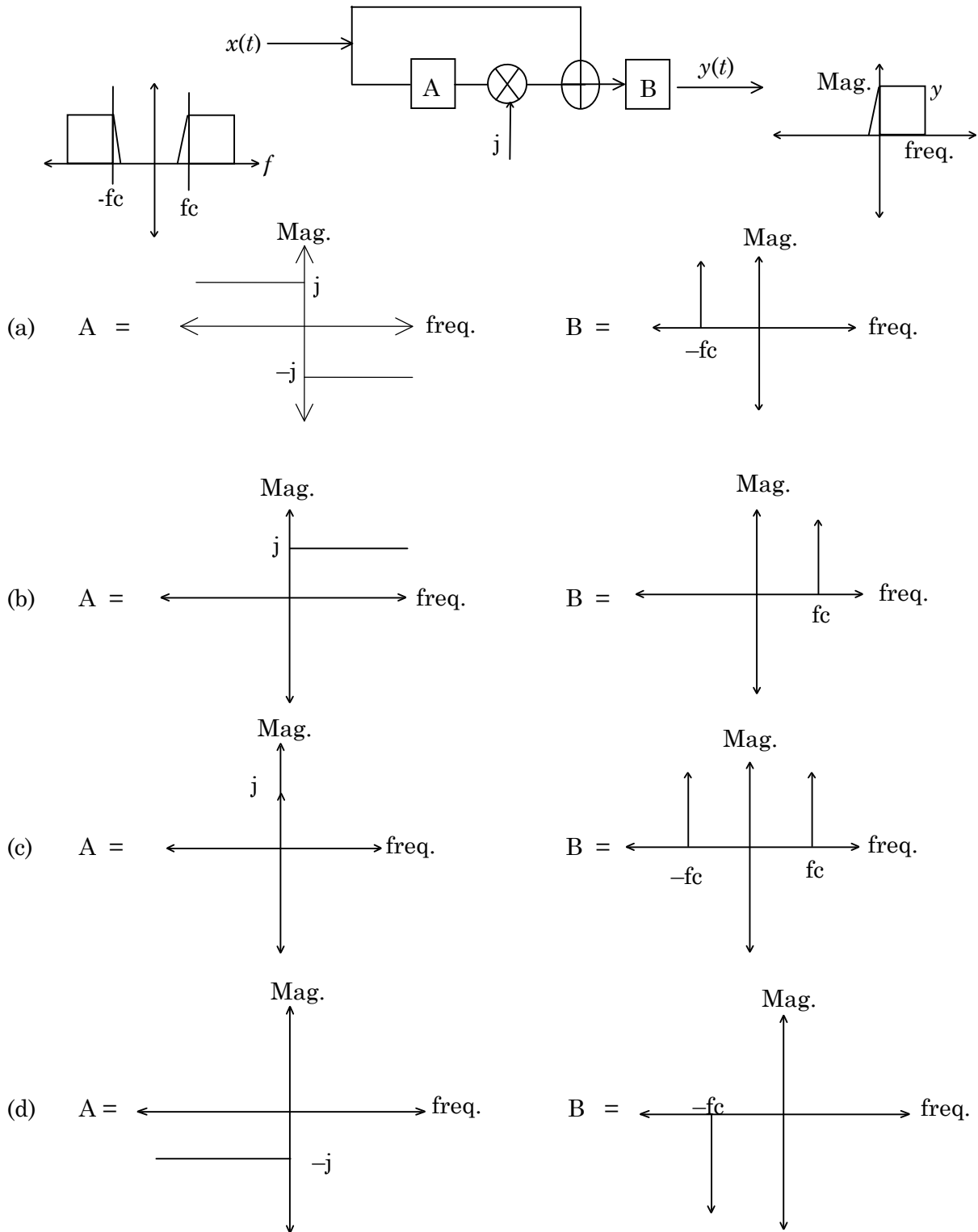
- (a) $\tan^{-1}(1/\omega RC)$ (b) $\tan^{-1}(\omega RC)$
(c) $\tan^{-1}(RC/\omega)$ (d) $\tan^{-1}(\omega/RC)$

45. The error in measurement of a dc voltmeter with input signal: 1.5 V, voltage range: 2 V, accuracy : $\pm (25 \text{ ppm of reading} + 5 \text{ ppm of range})$ is

- (a) $\pm 50 \mu V$ (b) $\pm 30 \mu V$
(c) $\pm 47.5 \mu V$ (d) $\pm 10 \mu V$



51. Consider the system with $x(t)$ as input and $y(t)$ as output. The frequency domain characteristics are shown in the figure. Which combination of A and B will give y as result?





52. The R = 1/3 convolution encoder defined by transfer functions

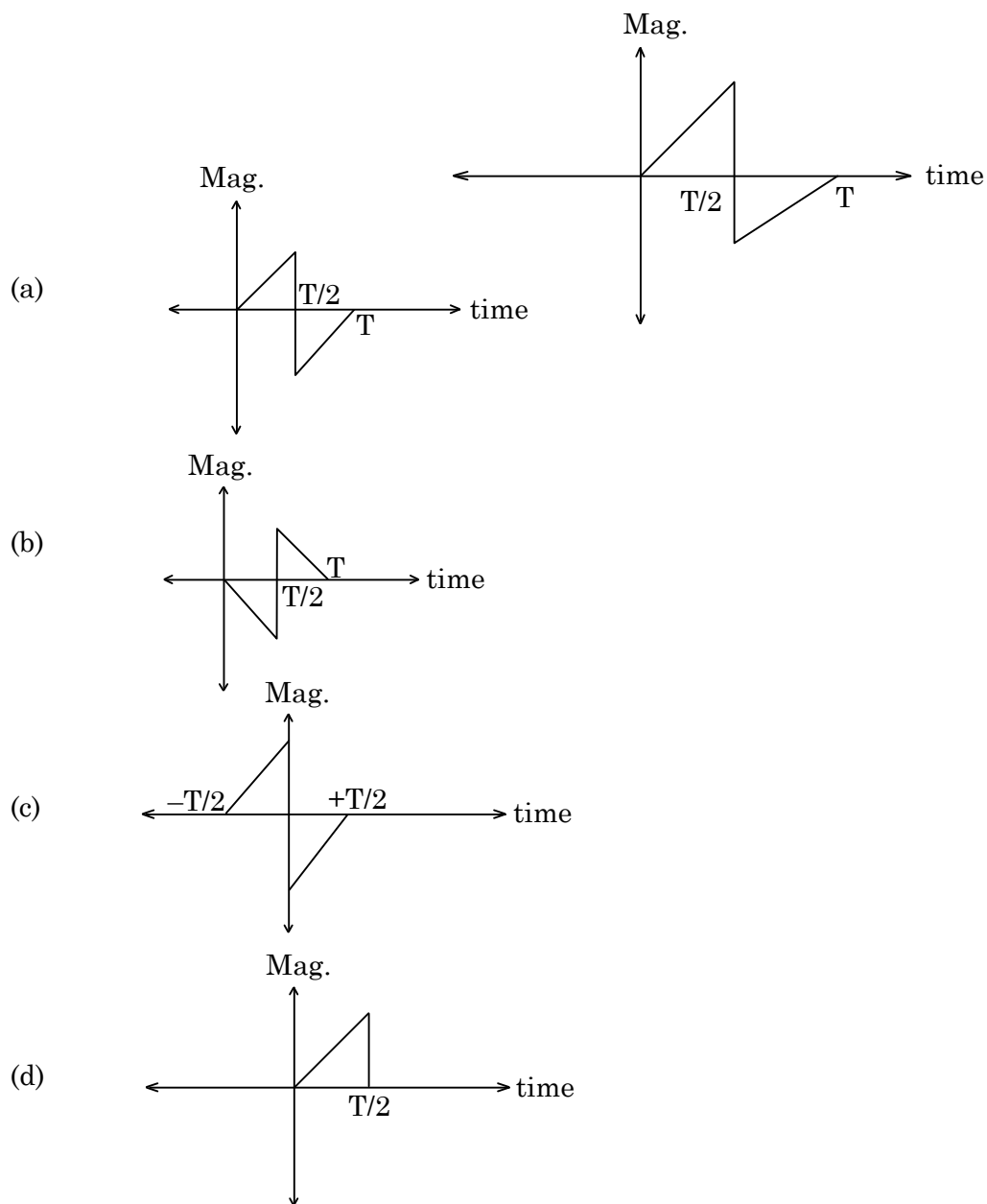
$$H1(z) = 1 + z^{-1}$$

$$H2(z) = 1 + z^{-2}$$

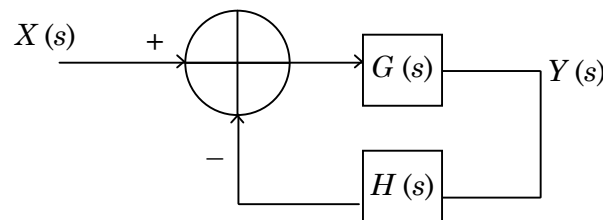
$$H3(z) = 1 + z^{-1} + z^{-2}$$

- (a) recursive and $K = 3$
- (b) systematic and $K = 2$
- (c) non-recursive and $K = 3$
- (d) non-recursive and $K = 2$

53. The match filter response for given signal sampled at $t = T$ is



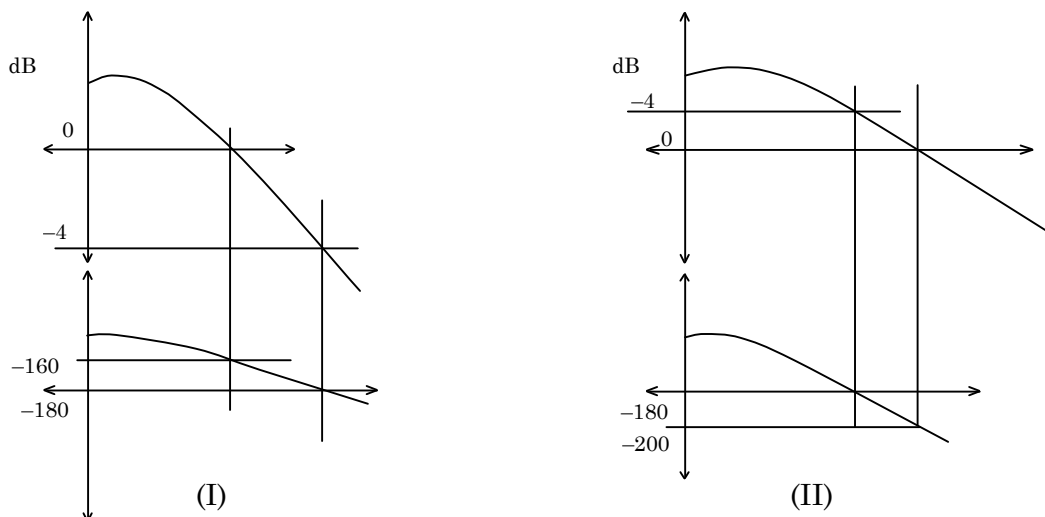
54. Characteristic equation of $H(s)$ is given as
 $3s^4 + 2s^3 + 5s^2 + s + 2 = 0$ is
 (a) unstable
 (b) stable
 (c) all poles in right half plane
 (d) unstable with only one pole in right half plane
55. Consider the feedback system



$$G(S) = \frac{K(s+4)}{s(s+1)} \quad H(s) = \frac{1}{s+2}$$

The value of gain for which system is marginally stable is

- (a) $K = 4$ (b) $K = 6$ (c) $K = 10$ (d) $K = 2$
56. Consider the Bode plots (magnitude and phase) of two different open loop transfer functions of two unity feedback systems. The open loop transfer functions have poles in right half plane. The closed loop system formed from these open loop systems. Which of the following holds true?



- (a) Closed loop system with I is stable and with II is unstable
 (b) Closed loop systems using I and II both are unstable
 (c) Closed loop system with I is unstable and II is stable
 (d) Closed loop system with I and II are stable

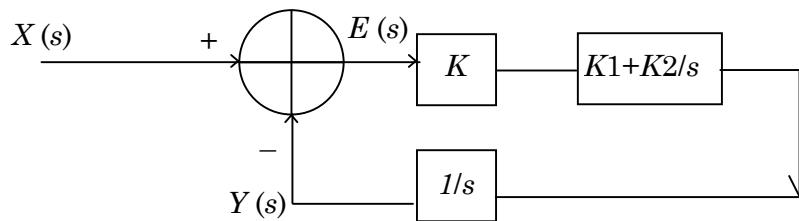


57. The steady state response for an input $X(s) = K/s$ to a system whose transfer function is $H(s)$ in time domain is

$$H(s) = 1/((s+5)(s+2))$$

- (a) $K/10$ (b) $e^{-5t}u(t)$
(c) $e^{-2t}u(t)$ (d) $(e^{-5t} + e^{-2t})u(t)$

58. Consider a closed loop stable phase locked loop system as shown in the diagram below



The system is capable of producing zero steady state error $E(t)$ for

- (a) Phase step only (b) Constant velocity and phase step
(c) Acceleration (d) Jerk

59. The modes in a reflex klystron

- (a) Result from excessive oscillating frequencies of the cavity
(b) Correspond to different oscillating frequencies of the cavity
(c) Are caused by spurious frequency modulation
(d) All give much the same frequency but different transit times

60. A dielectric is subjected to alternating electric field. The dielectric losses are proportional to

- (a) Real part of the dielectric constant
(b) Imaginary part of the dielectric constant
(c) Both Real and Imaginary part of the dielectric constant
(d) None of the above



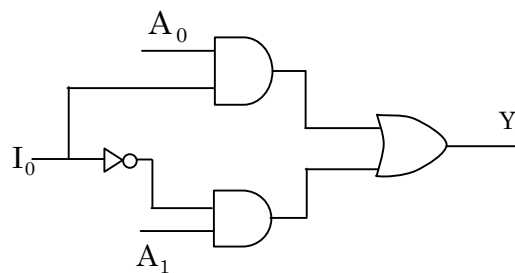
61. The electric field of a linearly polarized electromagnetic wave is given by $E_i = \hat{a}_x E_0(x, y) e^{-jkz}$ is incident upon a linearly polarized antenna whose electric field polarization is expressed as $E_a = (\hat{a}_x + \hat{a}_y) E(r, \theta, \phi)$. Find the polarization loss factor.

(a) 1/2 (b) 3/2 (c) 2/3 (d) 1/4

62. A lossless T-junction two way power divider has a source impedance, input transmission line impedance and o/p port load impedance of 50Ω . Find the output characterization impedances so that the input power is divided in a 2:1 ratio.

(a) $z_1 = 150 \Omega, z_2 = 75 \Omega$ (b) $z_1 = 50 \Omega, z_2 = 100 \Omega$
(c) $z_1 = 60 \Omega, z_2 = 120 \Omega$ (d) $z_1 = 30 \Omega, z_2 = 60 \Omega$

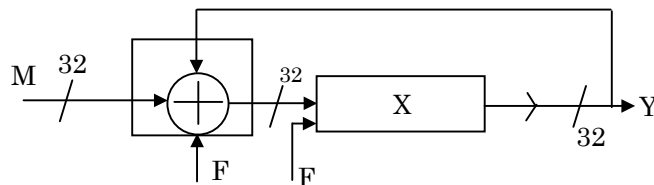
63. Following circuit implements a



- (a) De-Multiplexer (b) Multiplexer
(c) $Y = I_0 (A_0 + A_1)$ (d) $Y = I_0 (\overline{A_1} + A_0)$

64. The frequency of the output Y is

F : clock freq.
M : input
X : 32 bit register



- (a) $\frac{MF}{2^{32}}$ (b) $\frac{2MF}{2^{32}}$
(c) $\frac{F}{2^{32}}$ (d) $\frac{2^{32}F}{M}$





65. Consider the output A and B with I_0, I_1, I_2 and I_3 as input

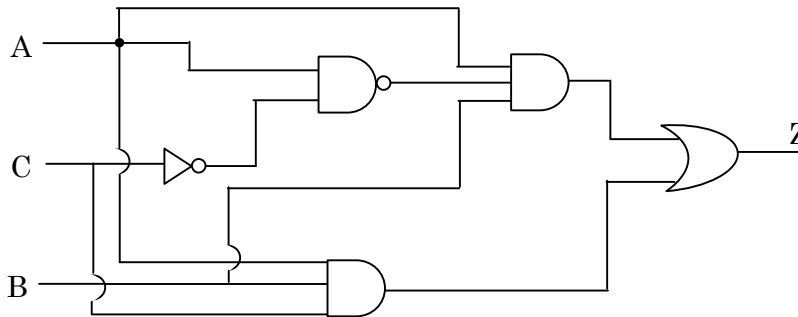
$$A = \overline{I_3} \overline{I_2} I_1 + I_3$$

$$B = \overline{I_3} I_1 + I_3$$

The above circuit is

- (a) 4:1 Multiplexer
- (b) De-Multiplexer
- (c) BCD circuit
- (d) Priority Encoder

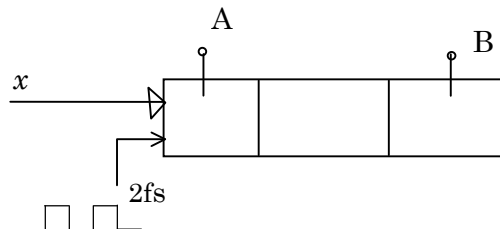
66.



The output Z =

- (a) $\overline{A} \overline{C} AB$
- (b) ABC
- (c) $ABC + A\overline{C}B$
- (d) $ABC + \overline{C}B$

67. Consider the shift register

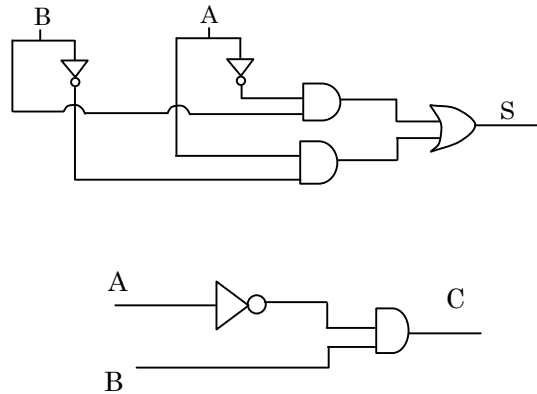


The frequency of signal x is f_s and the shift register is clocked at the positive edge of $2f_s$. The time offset between A and B is

- (a) $1/(2f_s)$
- (b) $1/f_s$
- (c) $3/(2f_s)$
- (d) $1/(4f_s)$

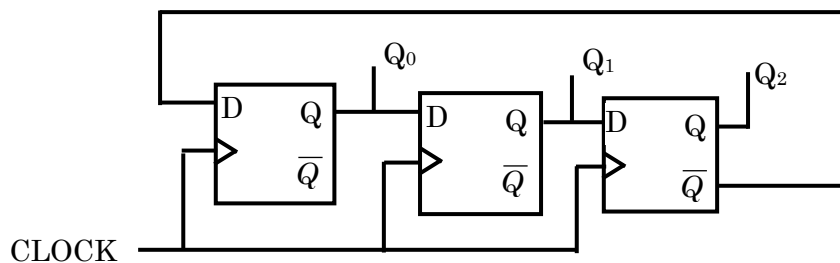


68. The circuit is formed as shown below. The output S and C implement



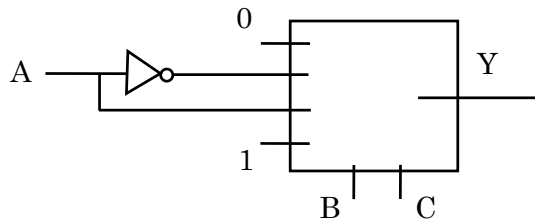
- (a) Two bit adder with sum and carry respectively
- (b) Two bit subtractor with sum and borrow respectively
- (c) $S = AB + \bar{A}\bar{B}$; $C = \bar{A}B$
- (d) None of the above

69. What is the value of the register formed from D flip-flops using Q_0 , Q_1 and Q_2 as output ($Q_0 Q_1 Q_2$) after 14 cycles



- (a) 110
- (b) 000
- (c) 001
- (d) 011

70. The 4:1 Multiplexer implemented as



Then $Y =$

- | | |
|--------------------------|--------------------------|
| (a) $\Sigma(1, 6, 3, 7)$ | (b) $\Sigma(1, 2, 5, 7)$ |
| (c) $\Sigma(2, 3, 4, 5)$ | (d) $\Sigma(1, 3, 4, 7)$ |

71. In a digital circuit the set-up time violation can be fixed by

- (a) Increasing the clock frequency
- (b) Increasing the delay of data path logic
- (c) Slowing the clock frequency
- (d) None of the above

72. Number of J-K flip flops in modulo 16 binary up-counter are

- | | |
|--------|-------|
| (a) 16 | (b) 4 |
| (c) 8 | (d) 2 |

73. The solid angle subtended by the sun as viewed from the earth is $\Omega = 4 \times 10^{-5}$ steradian. A microwave antenna designed to be used for studying the microwave radiation from the sun has a very narrow beam whose equivalent solid angle is approximately equal to that subtended by the sun. What is the approximate directivity, D ?

- | | |
|-----------------------|-----------------------|
| (a) 10^5 | (b) $\pi \times 10^5$ |
| (c) $\pi \times 10^6$ | (d) 10^6 |

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