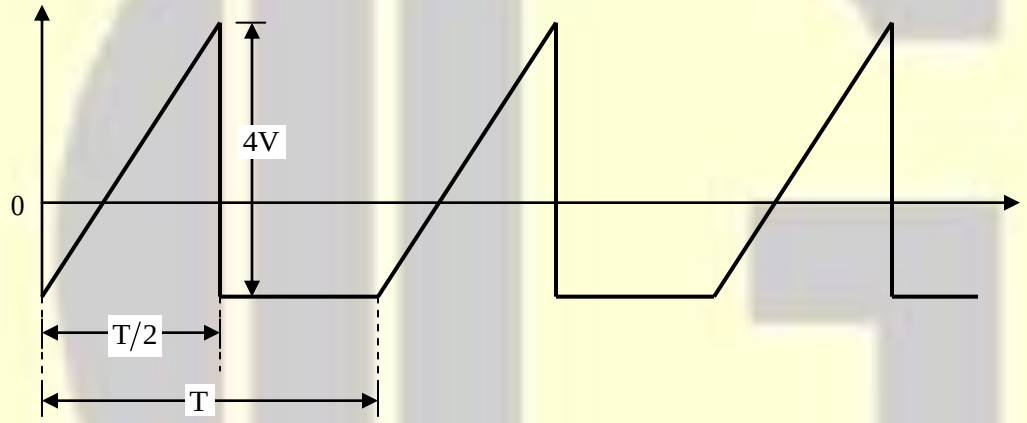
1. A random variable z, has a probability density function f(z), where $f(z) = e^{-z}$ $0 \le z \le \infty$, the probability of $0 \le z \le 2$ will be approximately

(A) 0.368 (B) 0.135 (C) 0.393 (D) 0.865

2. Evaluate: $\lim_{x \to \infty} \frac{\sqrt{x^2 + 5} - 3}{x^2 - 2x}$

(A) 1/3 (B) ∞ (C) –3 (D) 0

3. What is the rms of following waveform if the average value is zero?



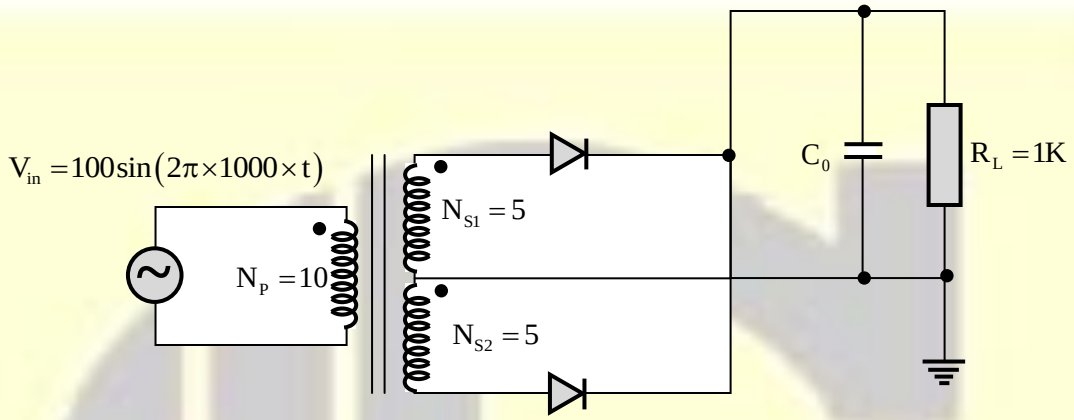
(A) $\sqrt{17/3}$V (B) $\sqrt{8/3}$V (C) $\sqrt{5/3}$V (D) $\sqrt{1/3}$V

4. A radar system uses TWTA as high power RF source for transmitting 300 W peak power. The efficiency of transmitter during pulse is 75% and the transmit duty is 25%. If the DC power required during pulse off period is 20 W. The average power dissipation in TWTA is

(A) 81.25 W (B) 125 W (C) 50 W (D) 40 W

5. If the transmitter and diodes in the following circuit are ideal. Find out the value of capacitor (C_0) provides 5% ripple voltage across R_L.

(Assume that $\sin^{-1}(0.95) \sim 2\pi/5$) in radians *l*n (0.95) = –0.051)



(A) 4.7 μF (B) 16.7 μF (C) 8.7 μF (D) 2.7 μF

---

6. Relationship between Doppler frequency shifts of two radars A and B having 0.1 foot and 0.05 foot wave lengths, 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

---

7. A sinusoidal input which can be reproduced in an op-amp without any distortion having slew rate of 10π V μs^{-1} and 5V peak output amplitude, has the maximum frequency of

(A) 1 kHz (B) 1 MHz (C) 31.42 kHz (D) 31.42 MHz

---

8. 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) Switching diode comprises of metal-semiconductor junction

---

9. Which of the following is NOT true about opto-couplers?

(A) It is a solid state device to isolate two parts of a circuit

(B) It can act as an input device or output device but not both

(C) Combines a light emitting diode and a phototransistor in a single package

(D) It prevents electrical noise or voltage transients of one circuit from integrating with other circuit

---

10. Which of the noise types is dominant in metal semiconductor field effect transistor (MESFET) when compared to bipolar junction transistor (BJT)?

(A) Thermal noise (B) Shot noise

(C) Flicker noise (D) All of these

---

11. Which factor determines the range resolution of a radar?

(A) Size of the antenna

(B) Bandwidth of the transmitted pulse

(C) Power radiated from the antenna

(D) Centre frequency of the radar

---

12. A signal having frequency component from DC-2 kHz is to be pulse code modulated with a 6 bit encoder. Minimum carrier bandwidth required is

(A) 4 kHz (B) 128 kHz (C) 16 kHz (D) 12 kHz

---

13. Which of the following is NOT true for Schmitt Trigger?

(A) Schmitt trigger can be used as sine-to-square wave converter

(B) Schmitt trigger uses op-amp in open loop mode

(C) Hysteresis exists in Schmitt trigger

(D) All of these

---

14. 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 these

---

15. In metals, the thermal conductivity K and electrical conductivity σ are related as $\frac{K}{\sigma T} = L$, where L is known as

(A) Lattice constant

(B) Lorenz number

(C) Langevin function

(D) Larmor number

---

16. 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

---

17. The cavity magnetron uses strapping to

(A) prevent mode jumping

(B) prevent cathode back-heating

(C) ensure bunching

(D) improve the phase focusing effect

---

18. The TWT is sometimes preferred to the magnetron as s 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

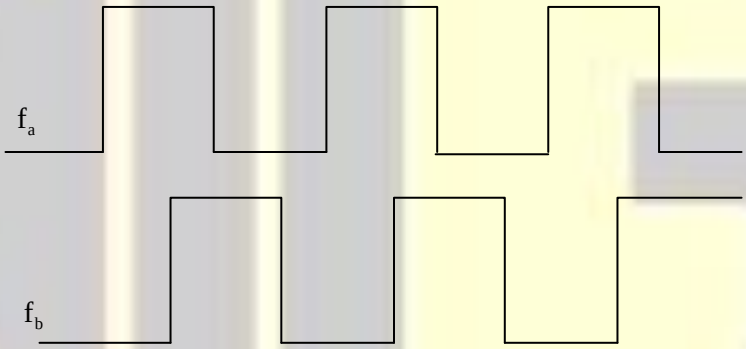
---

19. One of the reasons why conventional vacuum valve tubes are not used at microwave frequencies is that

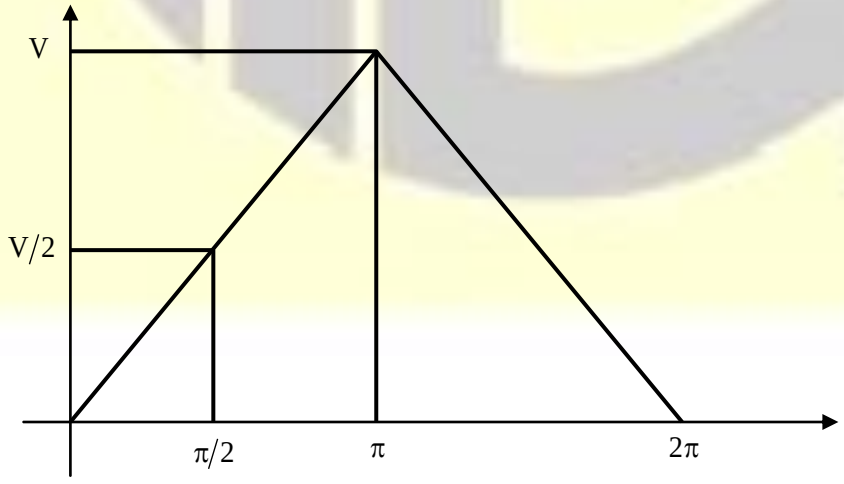
(A) their noise increases
(B) it has less transit time
(C) their shunt capacitive reactance become too large
(D) their series induction reactance become too small

---

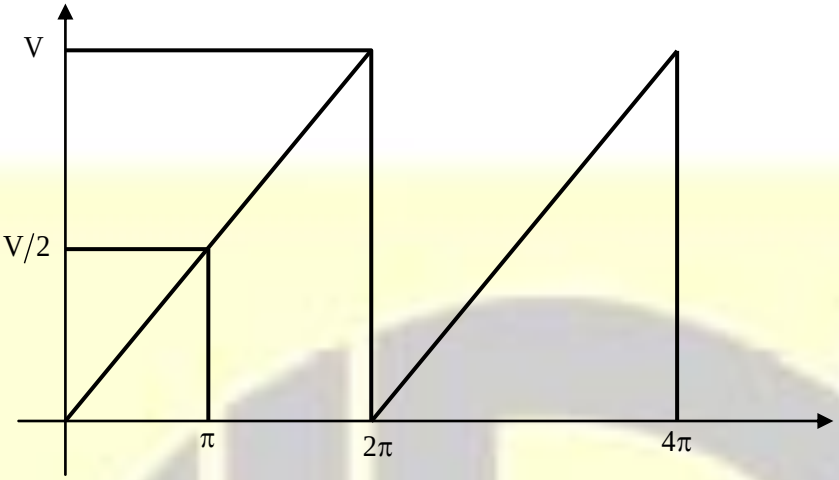
20. Two signals f_a and f_b are given as input to EX-OR to measure phase difference. The average output voltage will be



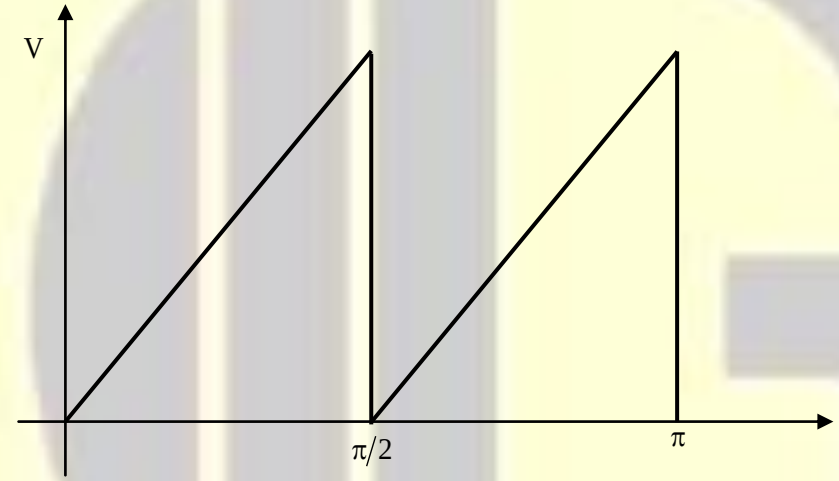
(A)



(B)



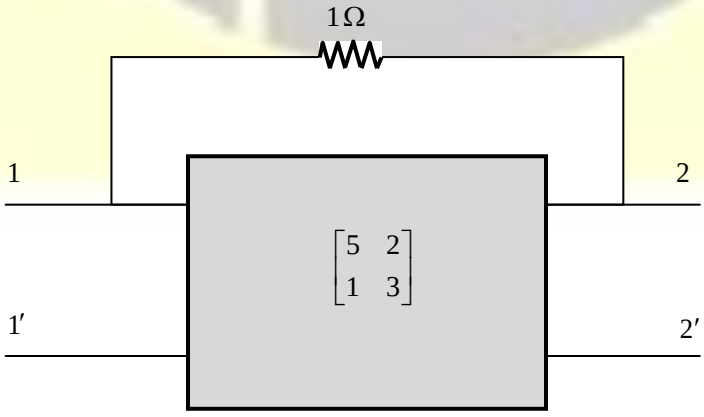
(C)



(D) None of these

---

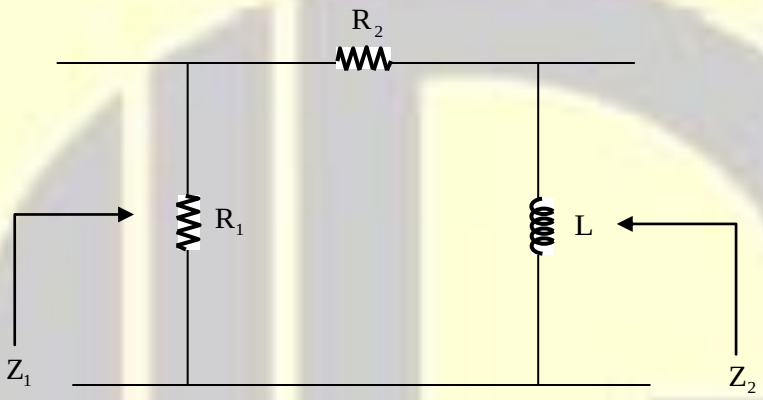
21. Y-parameter of a two-port network is shown below. A 1Ω resistor is connected to the network as shown. Find out the Y parameter of the whole network.



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

---

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



(A) $K_2 \times \frac{s}{(s+5)}$ (B) $\frac{(s+5)}{(s+K_2)}$ (C) $K_2 \times \frac{s}{(s+6)}$ (D) $\frac{(s+6)}{(s \times K_2)}$

---

23. Consider the signal

$$X(t) = \begin{cases} 2\cos(t) + \cos(2t) & t < 0 \\ 2\sin(t) + \sin(2t) & t \geq 0 \end{cases}$$

The signal X(t) is

(A) periodic with period 2π (B) periodic with period π

(C) non-periodic (D) periodic with period $\frac{\pi}{2}$

---

24. The system $y(t) = x(2t) + 3$ is

(A) linear and time invariant (B) causal and linear

(C) non-linear and time variant (D) linear and memoryless

25. Consider the system $R[m]=\sum_{n=0}^{N-1} y[n]x[n-m]$, where $y[n]$ and $x[n]$ are real periodic signals with period N. The above output can be obtained using

(A) IFFT {FFT [y] × conj (FFT[x]}

(B) IFFT {FFT[y] × FFT [x]}

(C) IFFT {FFT[y] × (FFT[–x])}

(D) IFFT {FIT[-Y] × (FFT [X])}

---

26. Consider the system defined by

$$\frac{d^2y}{dt^2}+(a+b)\frac{dy}{dt}+ab=x(t);\ a>b,\ b>0$$

can be realized using which impulse response function

(A) $h(t)=\left(e^{-at}+e^{-bt}\right)u(t)$

(B) $h(t)=\left(e^{-at}\times e^{-bt}\right)u(t)$

(C) $h(t)=\left(e^{at}+e^{-bt}\right)u(t)$

(D) $h(t)=e^{-(a+b)t}u(t)$

---

27. A continuous time signal has frequency content at f = 10 MHz, 50 MHz and 70 MHz. The signal is sampled at sampling frequency of 56 MHz. The frequency content of output will be

(A) 10 MHz

(B) 10 MHz and 6 MHz

(C) 10 MHz, 6 MHz and 14 MHz

(D) 46 MHz

---

28. The R = 1/3 convolution encode defined by transfer functions

$H_1(z)=1+z^{-1}$

$H_2(z)=1+z^{-2}$

$H_3(z)=1+z^{-1}+z^{-2}$

is

(A) recursive and K = 3

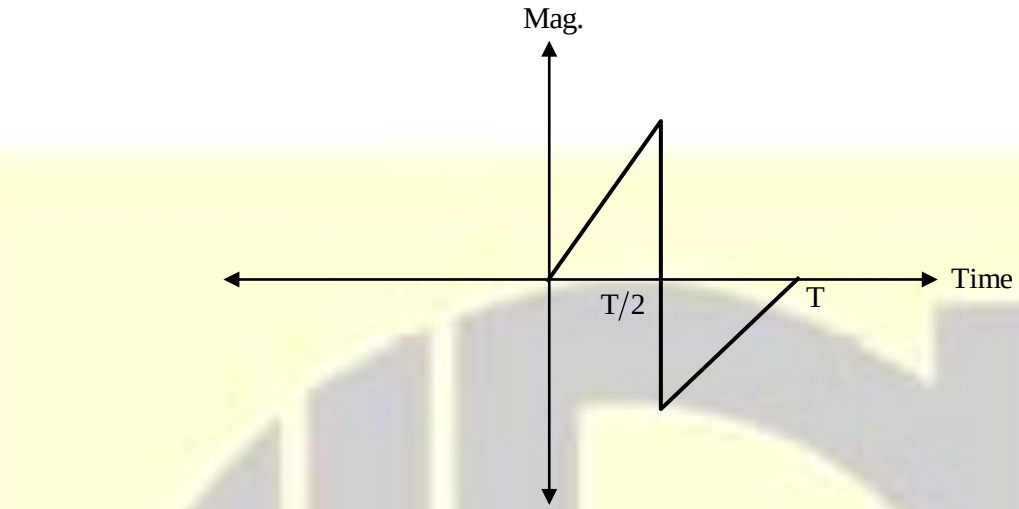
(B) systematic and K = 2

(C) non-recursive and K = 3

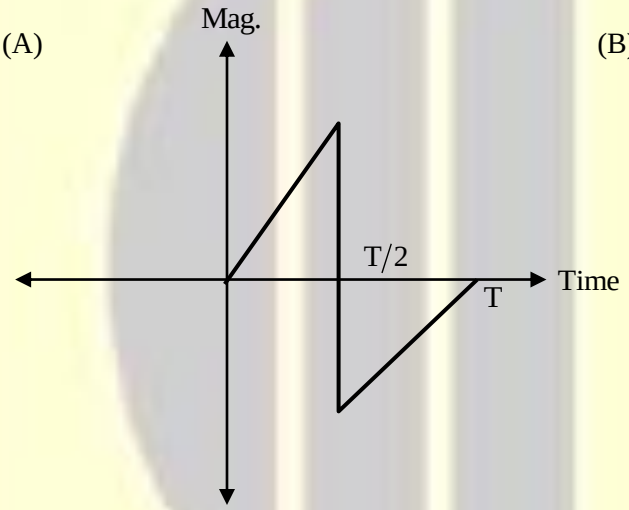
(D) non-recursive and K = 2

---

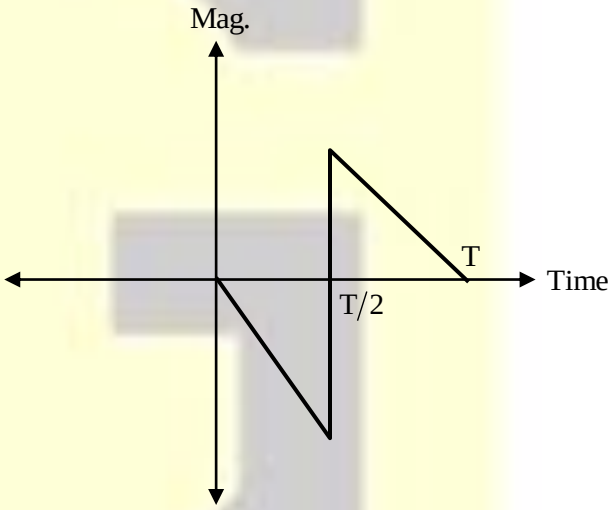
29. The match filter response for given signal sampled at t = T is



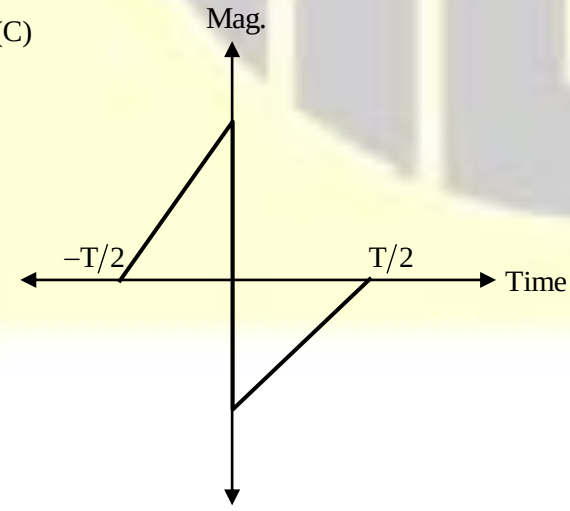
(A)



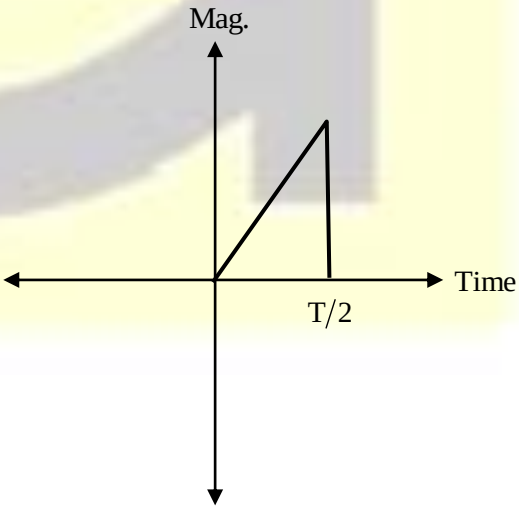
(B)



(C)



(D)



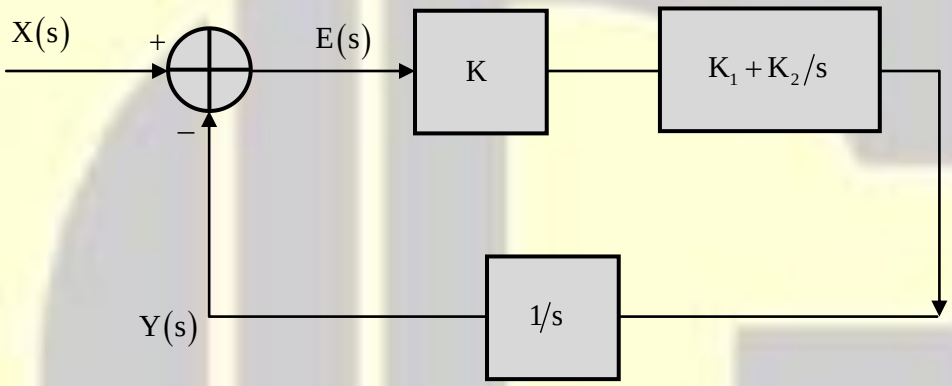
30. The steady-state response for an input X(s) = K/s to a system whose transfer function is H(s) in time domain is

$$H(s)=\frac{1}{(s+5)(s+2)}$$

(A) K/10 (B) $e^{-5t}u(t)$ (C) $e^{-2t}u(t)$ (D) $\left(e^{-5t}+e^{-2t}\right)u(t)$

---

31. 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

---

32. 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 time

---

33. 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 these

---

34. 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

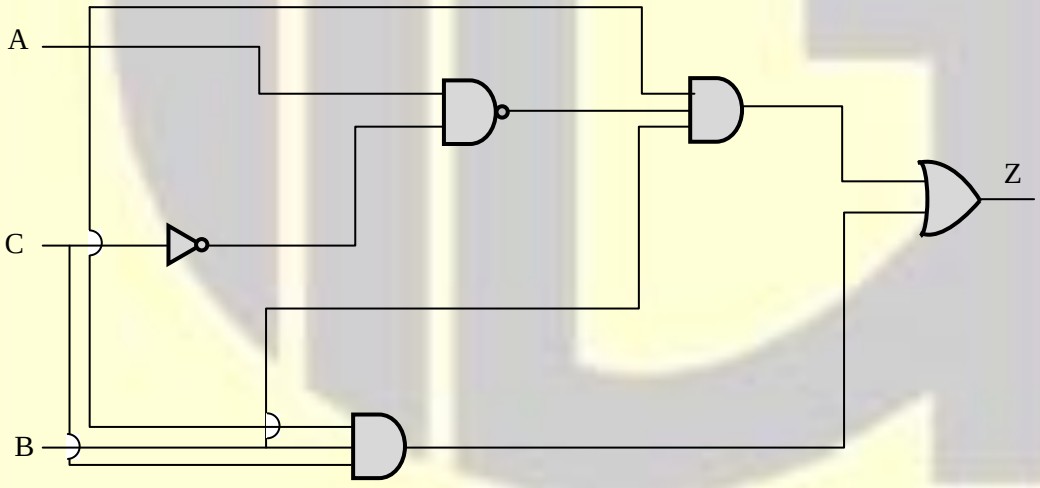
(B) de-multiplexer

(C) BCD circuit

(D) priority encode

---

35. The output Z = ?



(A) $\overline{A\overline{C}}\,AB$

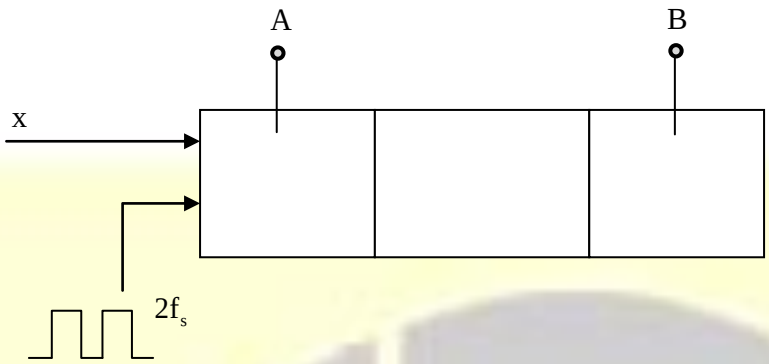
(B) ABC

(C) $ABC + A\overline{C}B$

(D) $ABC + \overline{C}B$

---

36. Consider the shift register:

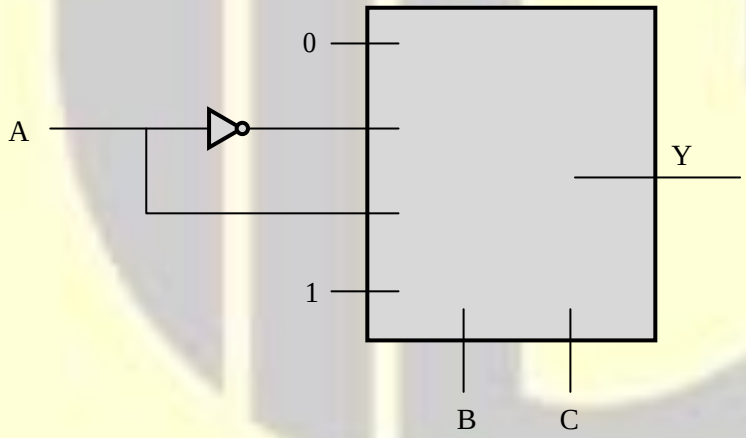


The frequency of signal x is f_s and the shift register is clocked at the positive edge of $2f_s$. The time offset between A and B is

(A) $1/(2f_s)$ (B) $1/f_s$ (C) $3/(2f_s)$ (D) $1/(4f_s)$

---

37. 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) $\Sigma(1,3,4,7)$

---

38. 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 these

39. Number of JK flip-flops in modulo 16 binary up-counter are

(A) 16 (B) 4 (C) 8 (D) 2

---

40. The solid angle subtended by the sun as viewed from the Earth is $\Omega = 4\times10^{-5}$ sterdian. 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) $\pi\times10^5$ (C) $\pi\times10^6$ (D) 10^6

---

41. An air filled rectangular waveguide R_1 is operating at the frequency 2 GHz and another air filled rectangular waveguide R_2 is operating at 4 GHz. The guide wavelengths of these waveguides at their respectively frequencies are equal. If the cut-off frequency of waveguide R_1 is 1 GHz, what is the cutoff frequency of the waveguide R_2 in GHz?

(A) $\sqrt{10}$ (B) $\sqrt{11}$ (C) $\sqrt{12}$ (D) $\sqrt{13}$

---

42. An electromagnetic wave propagates through a lossless insulator with a velocity $1.5\times10^{10}\,\text{cm s}^{-1}$. Calculate the electric and magnetic properties of the insulator if its intrinsic impedance is 90π ohms.

(A) $\varepsilon_r = 2.66\,\mu_r = 1.5$ (B) $\varepsilon_r = 1.5\,\mu_r = 2.66$

(C) $\varepsilon_r = 1.2\mu_r = 2.0$ (D) $\varepsilon_r = 2.0\,\mu_r = 1.2$

---

43. A square waveguide carries TE_{11} mode whose axial magnetic field is given by

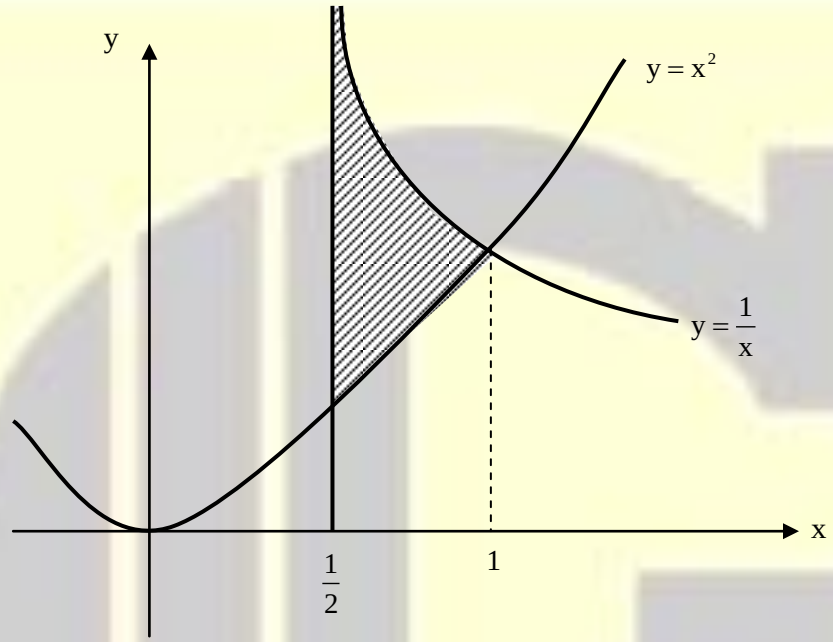
$$H_z = H_0 \times \cos\left(\frac{\pi x}{\sqrt{8}}\right) \times \cos\left(\frac{\pi y}{\sqrt{8}}\right) \text{A m}^{-1}$$

Where waveguide dimensions are in cm. What is the cut-off frequency of the mode?

(A) 5.5 GHz (B) 6.5 GHz (C) 7.5 GHz (D) 8.5 GHz

---

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



(A) $\ell n\, 2 - \frac{7}{24}$ (B) $\ell n\, 2 + \frac{7}{24}$ (C) $\ell n\, 3 - \frac{5}{24}$ (D) $\ell n\, 3 + \frac{5}{24}$

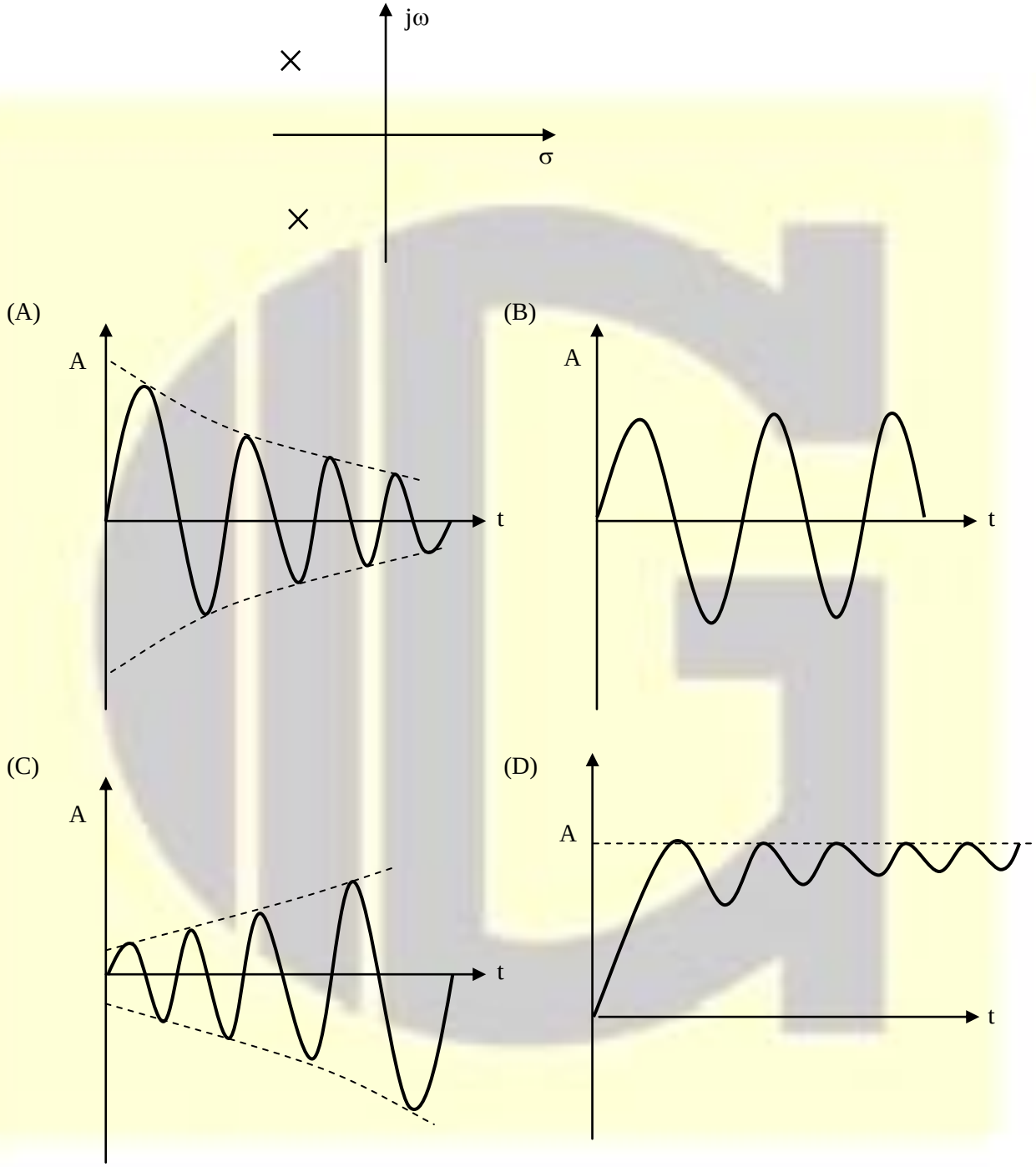
---

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

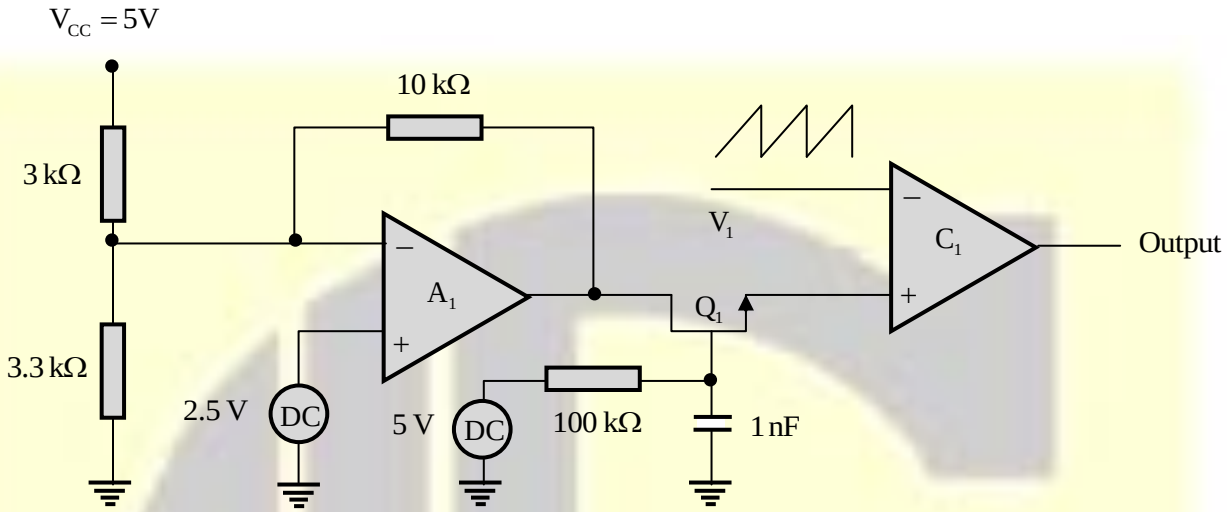
(A) 1 and 5 (B) 4 and 3 (C) 1 and 2 (D) 2 and 4

---

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

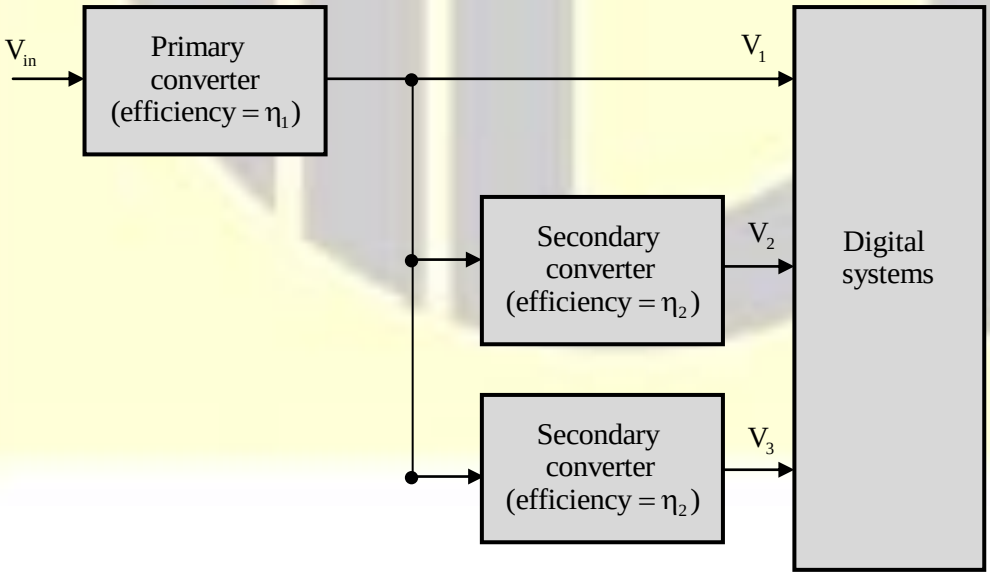


47. The ramp signal (voltages: 0 to 5V) is compared with the soft-start signal provided by N-channel MOSFET (Q_1) for amplifier (A_1) output. If Q_1 having low thresh-old voltage of 0.7V and negligible ON resistance. What is the duty of output signal of comparator (C_1) after 100 μs?



(A) 17.4% (B) 34.8% (C) 0% (D) 50%

48. 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) $\dfrac{4\times\eta_1\times\eta_2\times\eta_3}{\eta_2\eta_3+2\times\eta_3+\eta_2}$

(B) $\dfrac{\eta_1\times\eta_2\times\eta_3}{\eta_2\eta_3+2\times\eta_3+\eta_2}$

(C) $\dfrac{4\times\eta_1\times\eta_2\times\eta_3}{\eta_2\eta_3+\eta_2+\eta_3}$

(D) $\dfrac{2\times\eta_1\times\eta_2\times\eta_3}{\eta_2\eta_3+\eta_2+\eta_3}$

---

49. A sensistor exhibits the following characteristic:

(A) Either increase or decrease in resistance value with increase in temperature based on the material type used in the thermistor

(B) Always increase in resistance value with increase in temperature

(C) Always decrease in resistance value with increase in temperature

(D) No change in resistance value with temperature

---

50. When an electromagnetic wave is incident on an object having surface roughness comparable to the wavelength, then

(A) specular reflection occurs

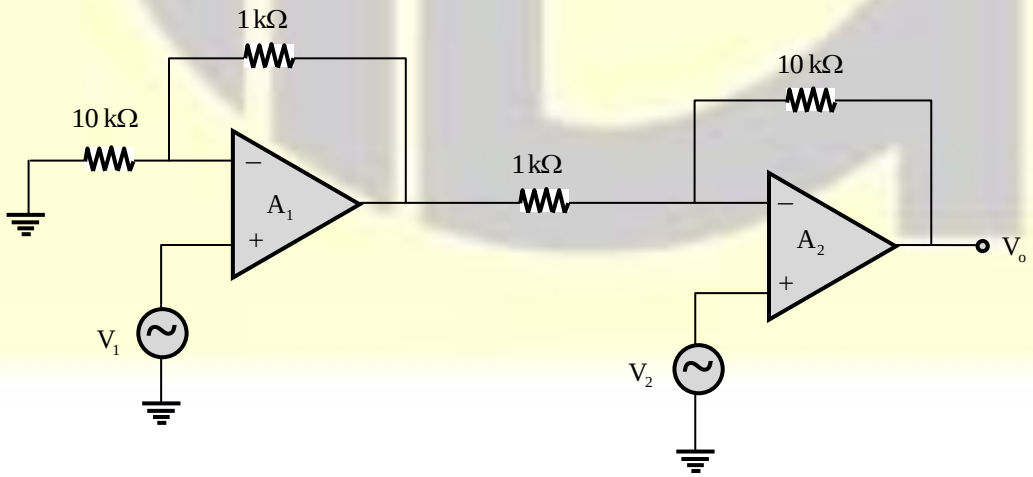
(B) absorption occurs

(C) diffused scattering occurs

(D) none of these

---

51. 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.



(A) $11V_2 - V_1$ (B) $V_2 - 11V_1$ (C) $11(V_2 - V_1)$ (D) None of these

52. Dominant mechanism for motion of charge carriers in forward and reverse biased silicon p-n junctions are

(A) drift in forward bias, diffusion in reverse bias

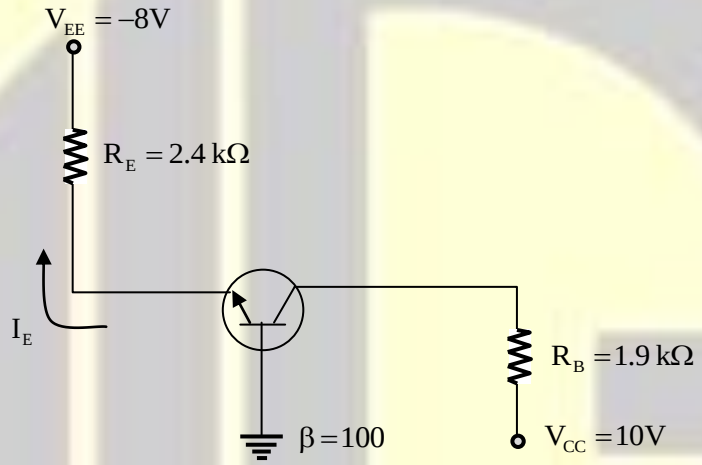
(B) diffusion in forward bias, drift in reverse bias

(C) diffusion in both forward and reverse bias

(D) drift in both forward and reverse bias

---

53. 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) $30.11\,\mu A$

---

54. 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 does not required periodic refreshing

(D) They are made up of six CMOS transistor

---

55. 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

---

56. 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

---

57. In a telecommunication trans-receive system, the transmitting antenna with antenna aperture of 1 m is fed with 1 W of power at 10 GHz. The receive antenna with antenna aperture 0.5 m located at 1 km away receives x mW of power. If the transmitting frequency changes to 20 GHz, what will be happen to receive power?

(A) Increase by 3 dB

(B) Increase by 6 dB

(C) Decrease by 3 dB

(D) Decrease by 6 dB

---

58. Find the maximum directivity of an antenna whose power density is given by $W_{rad} = \hat{a}_r \frac{A_0 \sin\theta}{r^2} W\ m^{-2}$ where A_0 is peak value of power density. θ is the usual spherical coordinate and $\hat{a}_r$ is the radial unit vector

(A) $\frac{4}{\pi}$ (B) $\frac{2}{\pi}$ (C) $\frac{3}{\pi}$ (D) $\frac{5}{\pi}$

---

59. A DC series motor is driven by a chopper circuit. The supply voltage is 220V and the duty cycle is 25%. Determine the DC voltage applied to the motor

(A) 165 V (B) 55 V (C) 220 V (D) 110 V

60. A single-phase full-wave AC phase controller feeds power to a resistive load of $100\,\Omega$ from a 220 V, 50Hz supply. What will be the rms output voltage at delay angles $\alpha_1 = \alpha_2 = \alpha = \frac{\pi}{2}$ of both transistors?

(A) $\frac{220}{\sqrt{2}}$V (B) $\sqrt{2\times 220}$V (C) $\sqrt{2}\times 110$V (D) $\sqrt{2}\times 220$ V

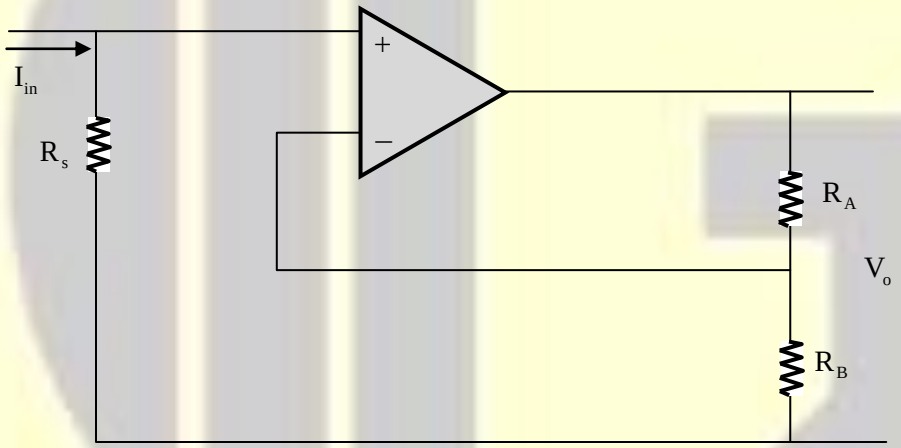
---

61. A half-wave rectifier is used to charge a 12 V battery through a resistance 'R'. The input transformer is fed by 34 V AC with turns ratio 2 : 1. Calculate the conduction period of the diode.

(A) 136° (B) 120° (C) 173° (D) 137°

---

62. In the following circuit, find the output voltage V_o :



(A) $(R_A/R_B)\times I_{in}\times R_s$ (B) $I_{in}\times R_s\times(1+R_A/R_B)$

(C) $(R_B/R_A)\times I_{in}\times R_s$ (D) $I_{in}\times R\times(1+R_B/R_A)$

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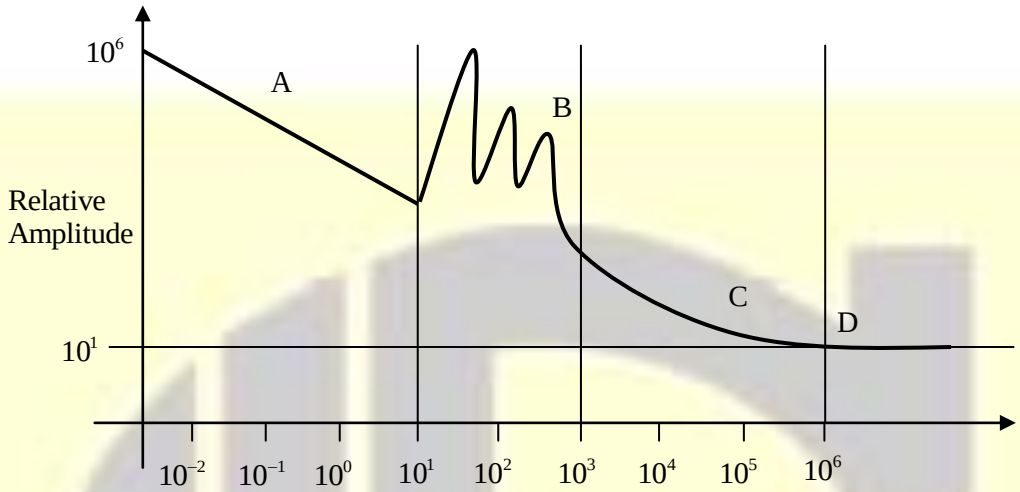
63. From the following relative amplitude vs frequency plot, identify the type of noise which the sections A, B, C and D depict.



(i) Thermal noise

(ii) Power line pick up

(iii) Power supply (EPC) switching noise

(iv) 1/f noise

(A) A-i, B-ii, C-iii, D-iv

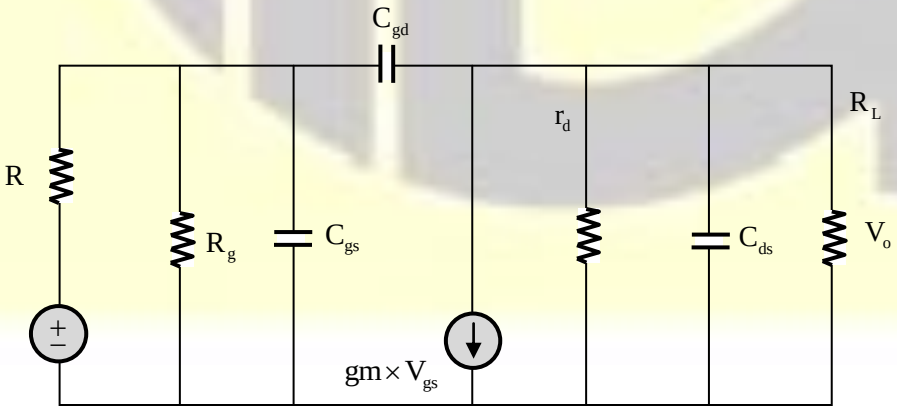
(B) A-ii, B-i, C-iv, D-iii

(C) A-iv, B-ii, C-iii, D-i

(D) A-iii, B-iv, C-ii, D-i

---

64. Following is the small-signal high-frequency equivalent circuit of a common source amplifier. V_o/V_i will be of the form (K, z_1, a_0, a_1, a_2, a_3 are constants containing circuit elements)

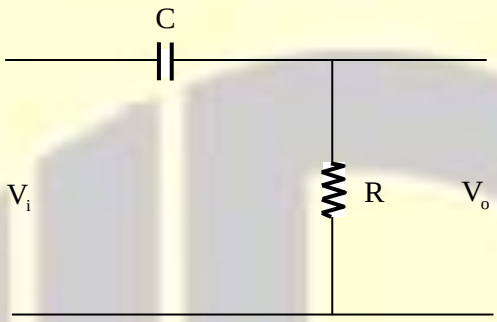


(A) $K(s-z_1)/(a_0+a_1s+a_2s^2)$ (B) $K.s/(a_0+a_1s+a_2s^2+a_3s^3)$

(C) $K(s-z_1)/(a_0+a_1s)$ (D) $K/(a_0+a_1s)$

---

65. 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) $\tan^{-1}(\omega/RC)$

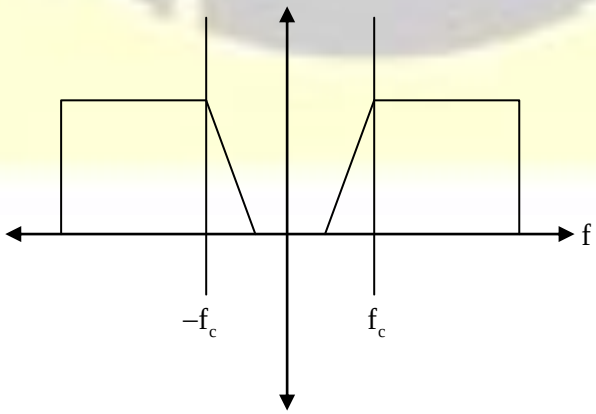
---

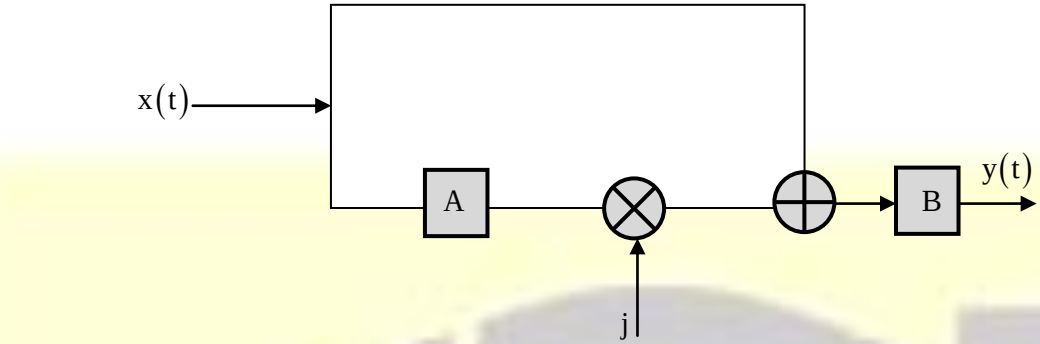
66. The error in measurement of a DC voltmeter with input signal: 1.5V, voltage range: 2V, accuracy: ± (25 ppm of reading + 5 ppm of range) is

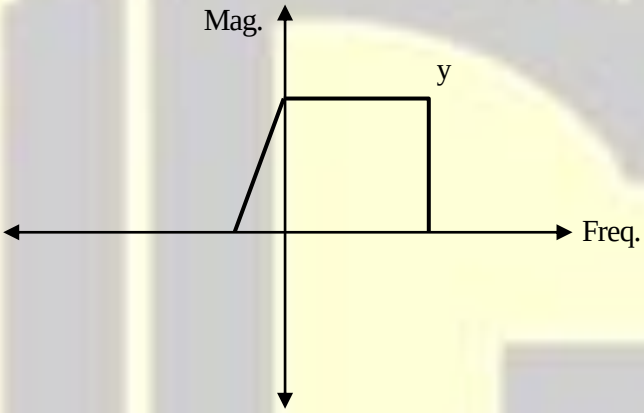
(A) $\pm 50\,\mu V$ (B) $\pm 30\,\mu V$ (C) $\pm 47.5\,\mu V$ (D) $\pm 10\,\mu V$

---

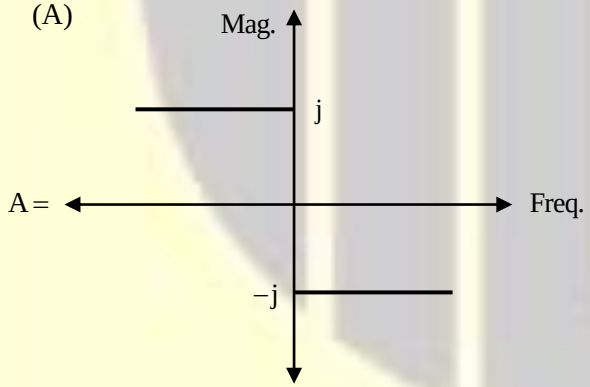
67. Consider the system with x(t) as input and y(t) as output. The frequency domain characteristics are shown in figure. Which combination of A and B will give y as result?

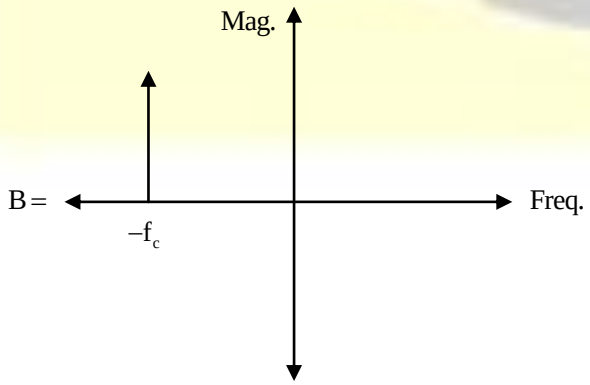




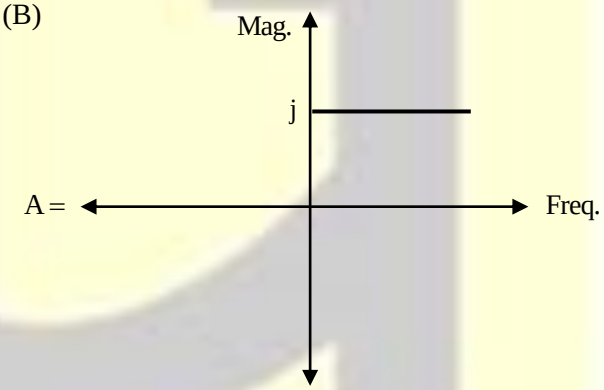


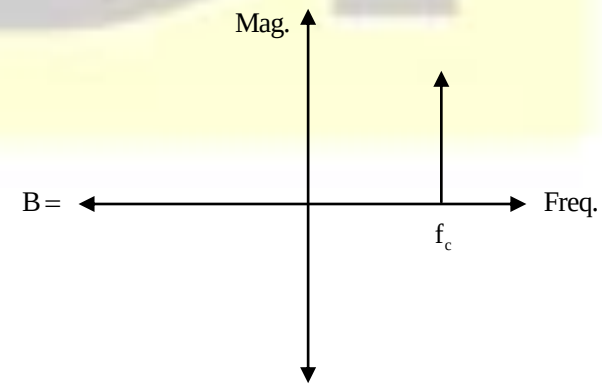
(A)



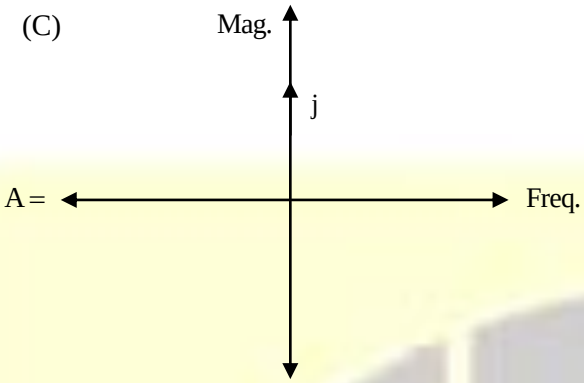


(B)

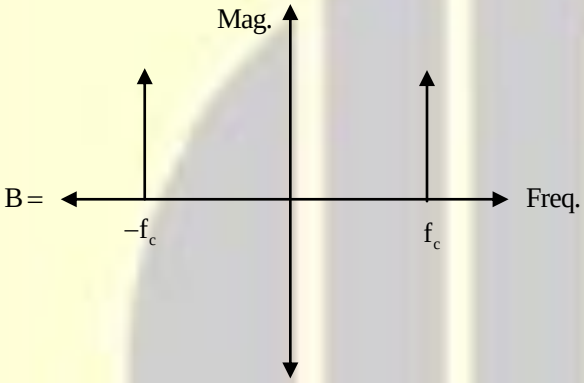


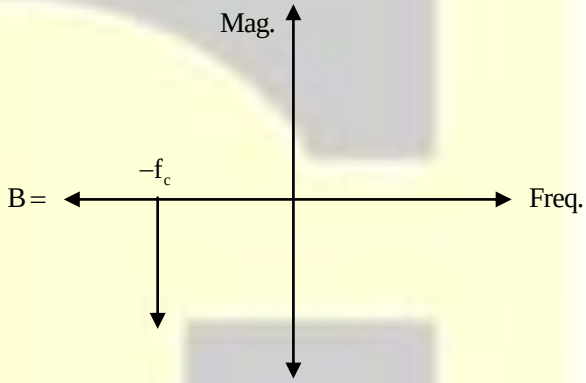


(C)



(D)





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68. Characteristic equation of H(s) is given as $3s^4 + 2s^3 + 5s^2 + s + 2 = 0$ is

(A) unstable

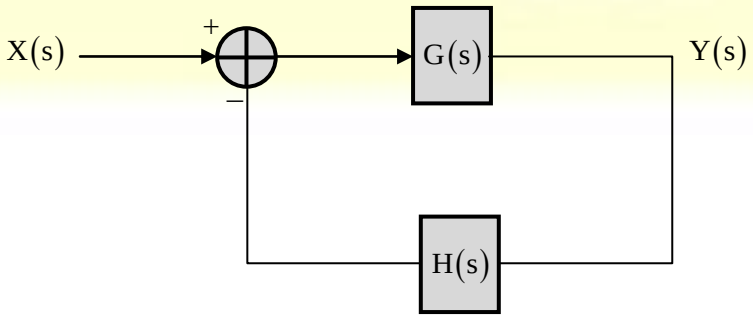
(B) stable

(C) all poles in right half plane

(D) unstable with only one pole in right half plane

---

69. Consider the feedback system:

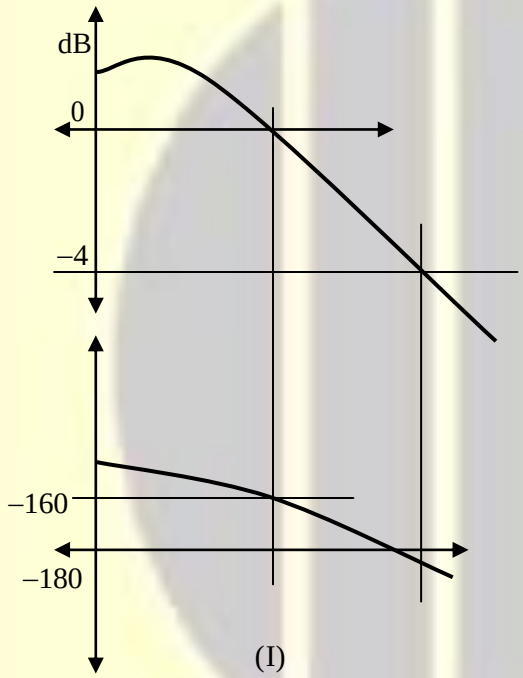


$$G(s)=\frac{K(s+4)}{s+1} \quad H(s)=\frac{1}{s+2}$$

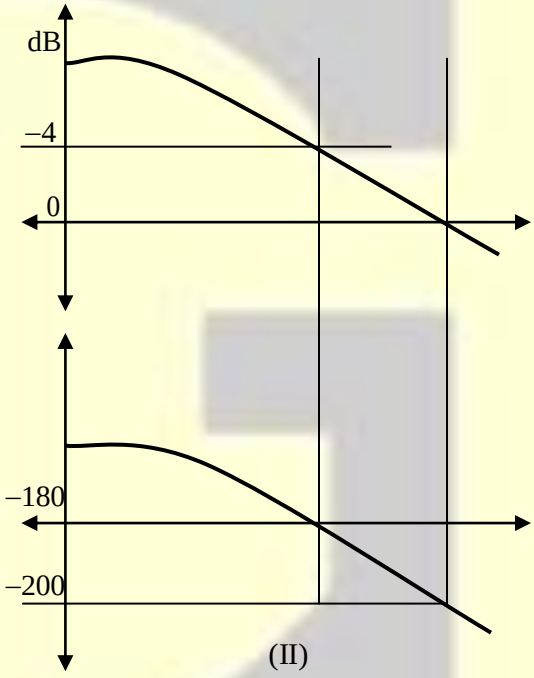
The value of gain for which system is marginally stable is

(A) K = 4 (B) K = 6 (C) K = 10 (D) K = 2

70. 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?



(I)



(II)

(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

71. 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 $E_o = (\hat{a}_x + \hat{a}_y)E(r,\theta,\phi)$. Find the polarization loss factor.

(A) 1/2 (B) 3/2 (C) 2/3 (D) ¼

---

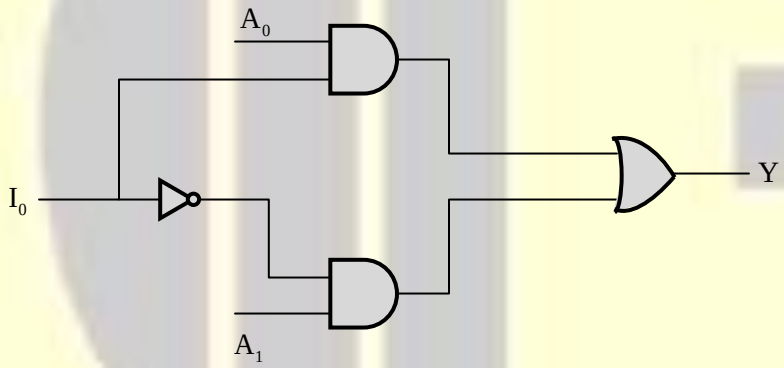
72. A lossless T-junction two way power divider has a source impedance, input transmission line impedance and output port load impedance of $50\,\Omega$. Find the output characterization impedances so that the input power is divided in a 2: 1 ratio.

(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) $z_1 = 30\,\Omega, z_2 = 60\,\Omega$

---

73. Following circuit implements a

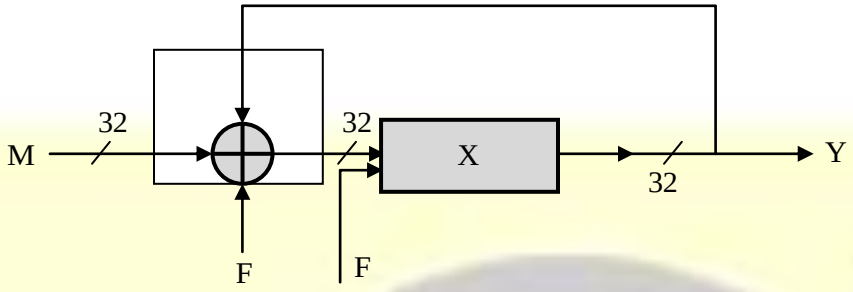


(A) de-multiplexer (B) multiplexer

(C) $Y = I_0(A_0 + A_1)$ (D) $Y = I_0(\bar{A}_1 + A_0)$

---

74. The frequency of the output Y is

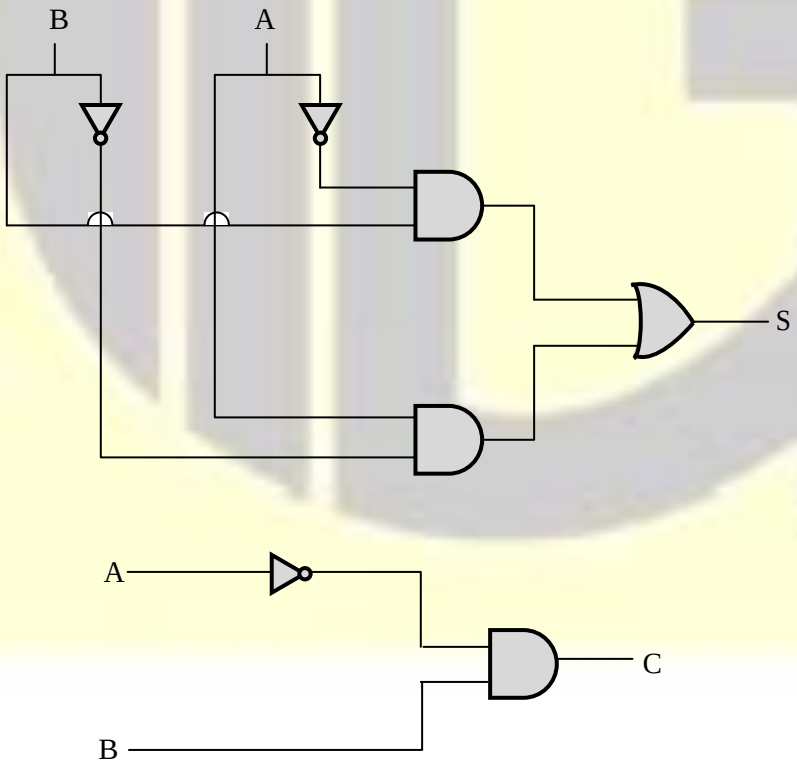


F : clock frequency
M : input
X : 32 bit register

(A) $\frac{MF}{2^{32}}$ (B) $\frac{2MF}{2^{32}}$ (C) $\frac{F}{2^{32}}$ (D) $\frac{2^{32}F}{M}$

---

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



(A) two bit adder with sum and carry, respectively

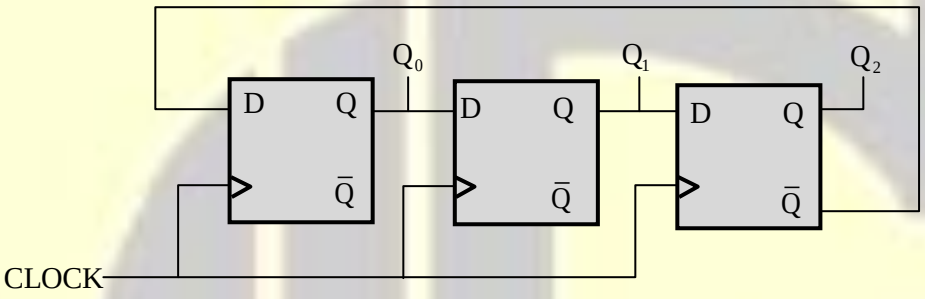
(B) two bit subtractor with sum and borrow, respectively

(C) $S = AB + \overline{AB}; C = \overline{A}B$

(D) None of these

---

76. 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

---

77. A gain-standard horn is known to have a gain G = 10. It is being used to measure the gain of a large directional antenna by the comparison method. When the antenna being measured is connected to the receiver it is found to be necessary to insert an attenuator adjusted to attenuate by 23 dB in order to have the same receiver output that was observed with the horn connected. What is the gain of the large antenna?

(A) 13 dB (B) 23 dB (C) 33 dB (D) 230 dB

---

78. A paraboloidal-reflector antenna is designed for operation at 3 GHz. Its largest aperture dimension is 20 feet. It is desired to build a scale model of this antenna with the largest aperture dimension scaled to 18 inches. At what frequency must this model be operated in order to have the same pattern as the full-size antenna?

(A) 10 GHz (B) 20 GHz (C) 40 GHz (D) 4 GHz

---

79. An antenna has a radiation resistance of $72\,\Omega$, a loss resistance of $8\,\Omega$ and power gain of 16. Calculate its directivity.

(A) 15.8 (B) 16.8 (C) 17.8 (D) 18.7

80. The current density at the surface of a thick metal plate is 100 A m^{-2}. What is the skin depth if the current density at a depth of 0.0059 cm is 0.272 A m^{-2}?

$\left[\ell\text{n}(10) \approx 2.3, \ell\text{n}(2.72) \approx 1\right]$

(A) $5\,\mu\text{m}$ (B) $10\,\mu\text{m}$ (C) $15\,\mu\text{m}$ (D) $20\,\mu\text{m}$