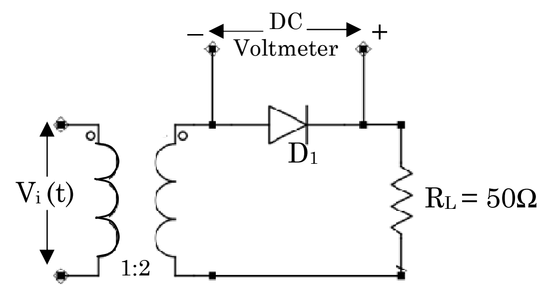
1. Electric Field of 1 V/m is applied to a Boron doped Silicon semiconductor slab having doping density of 10^{16} atoms/cm^3 at 300K temperature. Determine the approximate resistivity of the slab. (Consider intrinsic carrier concentration of Silicon at 300 K = 1.5×10^{10} / cm^3 Hole Mobility = 500 cm^2/Vs at 300 K; Electron Mobility = 1300 cm^2/Vs at 300 K).

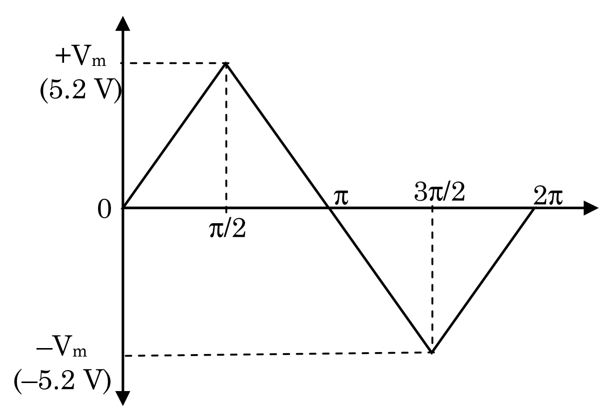
(a) 0.48 Ω-cm (b) 0.35 Ω-cm

(c) 0.16 Ω-cm (d) 1.25 Ω-cm

2. What will be the voltage reading of DC Voltmeter placed across the terminals of the Diode in the circuit below,



having the following periodical input signal 'V_i (t)'



(Assume cut-in voltage of the Diode = 0 V; Forward resistance of the Diode = 2 Ω)

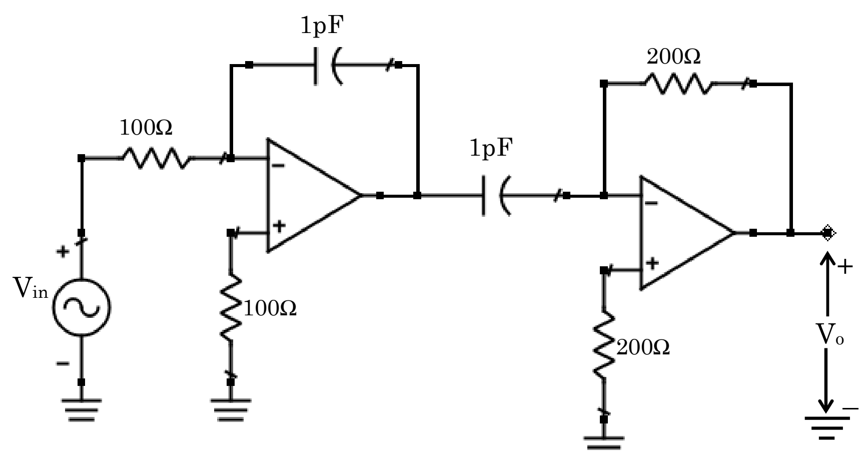
(a) 1.25 V (b) 2.5 V

(c) 0 V (d) 0.1 V

3. An ideal p-n junction diode in series with a 100 Ω resistance is forward biased such that the forward current flowing through the diode is 100 mA. If voltage across this circuit is instantaneously reversed to 20 V at time instant $t = t_0$, then the reverse current flowing through the diode at time instant $t = t_0$ is approximately given by

(a) 0 mA
(b) 200 mA
(c) 100 mA
(d) 2 mA

4. Determine output voltage 'V_0' for below circuit where $V_{in} = \text{Sin}(100\pi t)$

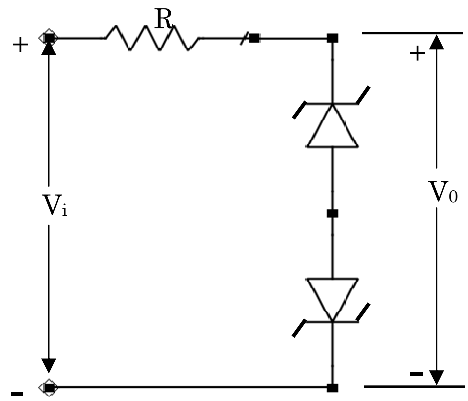


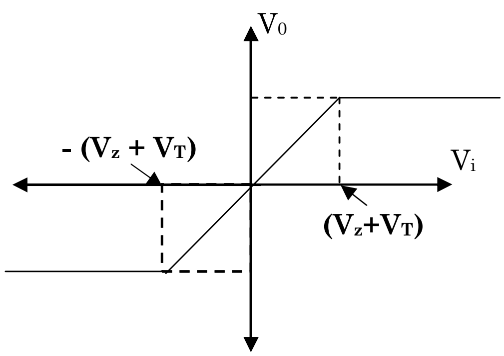
(a) $2\ \text{Sin}(100\pi t)$
(b) $\text{Sin}(100\pi t)$
(c) $\text{Sin}(200\pi t)$
(d) $0.5\ \text{Sin}(100\pi t)$

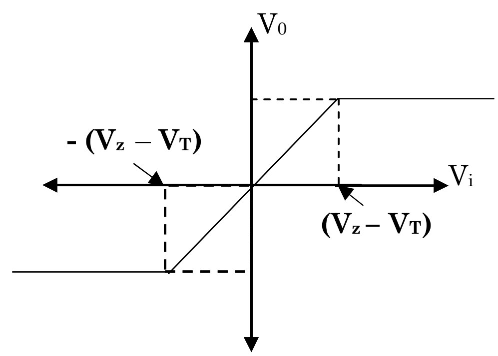
5. Determine the channel half-width for an n-channel silicon FET having Gate-to-Source voltage, $V_{GS} = V_p/4$, where V_p is the Pinch-off voltage and drain current, $I_d = 0$. (Consider (a) Donor Concentration $N_D = 10^{15}$ electrons/cm^3 (b) Channel half-width for $V_{GS} = 0$ V is 3μm).

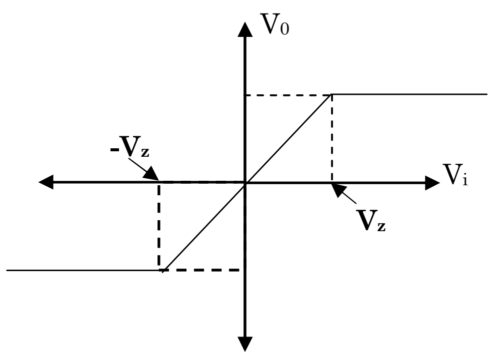
(a) 2.25 μm
(b) 3 μm
(c) 1.5 μm
(d) 0.75 μm

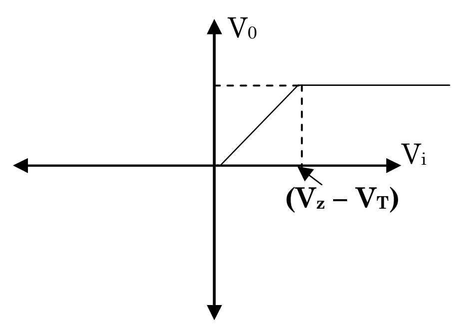
6. Determine the Voltage transfer characteristics of the following circuit comprising of Zener diodes having identical characteristics with Zener Breakdown voltage V_z and Diode cut-in voltage V_T.



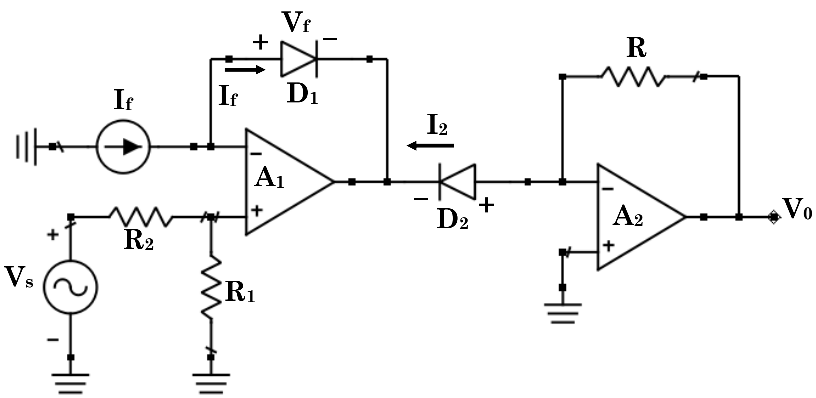
(a)


(b)


(c)


(d)


7. The circuit shown in the fig. below is a:

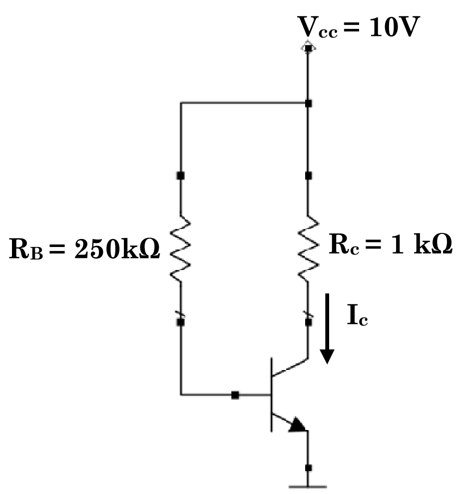


(A_1 & A_2 are ideal op-amps)

(a) Logarithmic Multiplier
(b) Logarithmic Amplifier
(c) Antilog Amplifier
(d) None of the above

8. Determine the change in collector current, ΔI_c due to change in base emitter voltage V_{BE} from 25°C to 100°C for a Silicon Transistor in Fixed Bias Configuration having $\beta = 100$.

(Consider following variation in Silicon transistor parameters with temperature- At T= 25°C, V_{BE} = 0.65 V and At T = 100°C. V_{BE} = 0.5 V)



(a) 60 μA
(b) 30 μA
(c) 15 μA
(d) 120 μA

9. A monostatic pulsed radar operating at 30GHz has a transmitter with 2KW O/P power and an antenna with 30dB gain. Minimum detectable signal in the receiver is –100dBm. Determine the maximum range of the radar, if it is required to detect a target having radar cross section of 10sq.m (consider $\log_{10} 4\pi = 1.1$). Assume EM wave propagate under ideal conditions.

(a) 10 km (b) 21.5 km
(c) 56 km (d) 100 km

10. Which of the following statement is not true about delay line cancellers?

(a) It eliminates DC components of fixed targets and passes AC components of moving targets
(b) It is used in moving target indicator radar
(c) Time delay in one channel of the delay line canceller is one half of the pulse repetition period
(d) It rejects any moving target whose Doppler frequency happens to be the same as the PRF or a multiple thereof

11. An air filled rectangular waveguide with dimensions a = 75 mm, b = 37.5 mm has same guide wavelength at frequencies f_1 and f_2 when operated at TE_{10} and TE_{20} modes respectively. If the frequency f_1 is $\sqrt{13}$ GHz, what is frequency f_2 in GHz?

(a) 10 (b) 5
(c) $\sqrt{13}/2$ (d) $2\sqrt{13}$

12. A waveguide of dimensions a = 15 mm and b = 7.5 mm is used as a high-pass filter. If the stop band attenuation required at 8 GHz is ~109.2 dB, what is the length of the filter? (assume conductor losses to be zero, approximate π = 3.14 and 1 Np ~8.69 dB) ($\log_{10} e = 0.4343$)

(a) 100 mm (b) 869 mm
(c) 86.9 mm (d) 54.6 mm

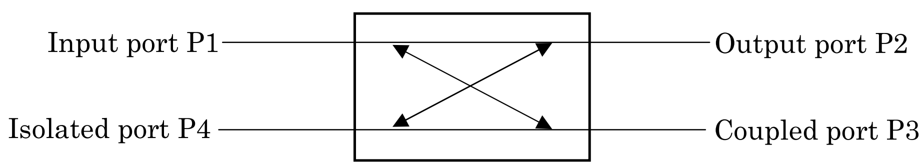
13. An RF signal is applied to a 50Ω lossless transmission line which is terminated in a load with impedance, Z_L = j50. The wavelength is 8 cm. Find the position of voltage and current maximum respectively nearest to the load measured from load end?

(a) 1 cm, 3 cm (b) 3 cm, 1 cm
(c) 3 cm, 5 cm (d) 5 cm, 3 cm

14. Design a single section, quarter wave impedance transformer at 5 GHz from 3.75 cm × 2 cm guide to 3.75 cm × 1 cm guide. Assume air filled wave guide with transformer section having same width as that of the input and output sections.

(a) Height = 1.414 cm, Length = 3 cm
(b) Height =1.5 cm, Length = 2.5 cm
(c) Height = 1.414 cm, Length = 2.5 cm
(d) Height = 1.5 cm, Length = 3 cm

15. A four port directional coupler has 4:1 power splitting ratio and has dissipation loss of 3dB. The coupler directivity is 40dB. What fraction of input power P1 will go to ports P2 and P3?



(a) P2 = 0.4 × P1, P3 = 0.1 × P1
(b) P2 = 0.8 × P1, P3 = 0.2 × P1
(c) P2 = 0.6 × P1, P3 = 0.15 × P1
(d) P2 = 0.1 × P1, P3 = 0.4 × P1

16. A cell phone transmits at a power level of 800 mW with an antenna gain of 3.0 dB. The cell tower has an antenna gain of 10.0 dB and is at a distance of 5 km away. Transmission frequency is 600 MHz. Noise level at Receiver Input is –95 dBm and required Signal to Noise ratio to close the link is 5 dB. Find the link margin in dB. (assume $\pi^2 = 10$)

(a) 150 dB
(b) 60 dB
(c) 30 dB
(d) 35 dB

17. What is the value of magnetic flux in Weber, if it is 2000 in Maxwell?

(a) 2×10^{-5}
(b) 2×10^{-3}
(c) 2×10^{5}
(d) 2×10^{3}

18. How resistance of Eureka varies with temperature?

(a) Decreases
(b) Linearly Increases
(c) Remains Constant
(d) Exponentially increases

19. Two resistances of values 2Ω and 4Ω made of different materials with temperature coefficients of resistance 3 ppm/°C and 6 ppm/°C respectively are connected in series. What is the temperature coefficient of resistance of the net resistance?

(a) 5 ppm/°C
(b) $\sqrt{18}$ ppm/°C
(c) 9 ppm/°C
(d) 4.5 ppm/°C

20. Which of the following semiconductor compound is not used in the construction of Light Emitting Diodes?

(a) GaAs
(b) GaP
(c) GaSe
(d) GaN

21. An LC tank circuit resonates at a frequency 'f_r'. If the temperature coefficient of permittivity of the dielectric material used in the Capacitance is 6 ppm/°C, then what is the temperature coefficient of frequency 'f_r'.

(a) –3 ppm/°C
(b) –6 ppm/°C
(c) 3 ppm/°C
(d) 6 ppm/°C

22. To avoid difficulties with strapping at high frequencies, the type of cavity structure used in the magnetron is,

(a) Hole and Slot
(b) Slot only
(c) Vane
(d) Rising-Sun

23. The transmit time in the repeller space of a reflex klystron must be (n+3/4) cycles to ensure that,

(a) Electrons are accelerated by the gap voltage on their return
(b) Returning electrons give energy to the gap oscillations
(c) It is equal to the period of the cavity oscillations
(d) The repeller is not damaged by striking electrons

24. An antenna is fed with 200π W power. The efficiency of the antenna is 75%. If the radiation pattern of the antenna is

$P(\theta, \phi) = \sin^2\theta \times \sin^2\phi$ for $0 \le \theta \le \pi$ (azimuth angle) and $0 \le \phi \le \pi$ (elevation angle).

$= 0$ elsewhere

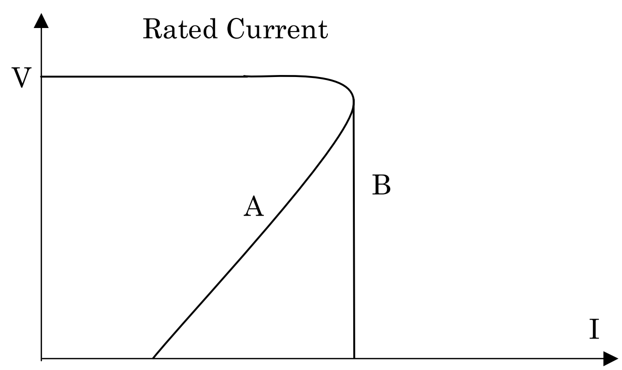
Find the radiation intensity in the direction of maximum radiation

(a) 225 W/steradian
(b) 150π W/steradian
(c) 200π W/steradian
(d) 250 W/steradian

25. A reflex klystron is oscillating at 10GHz when operated in $2\frac{3}{4}$ mode, find the transit time of the electron in repeller space in nano seconds (ns).

(a) 0.25
(b) 0.275
(c) 0.036
(d) 0.55

26. Identify A and B current limiting techniques in a.c. to d.c. power supplies respectively, in the graph below.



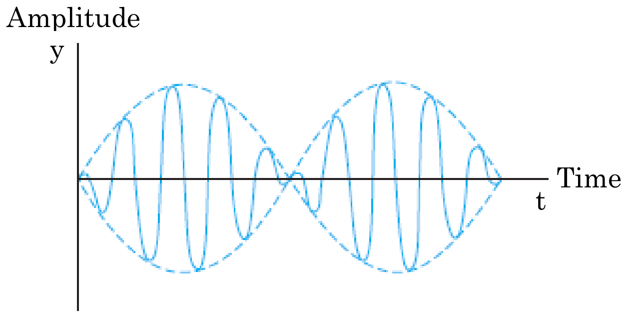
(a) Current limiting Mode, Constant Current Mode
(b) Re-entrant limiting Mode, Current limiting Mode
(c) Current limiting Mode, Fold back limiting Mode
(d) Fold back limiting Mode, Re-entrant limiting Mode

27. A Gold cavity resonator resonating at 10 GHz is fully coated using 2μm YBCO (Yttrium Barium Copper Oxide) material and operating at boiling temperature of liquid nitrogen. What is the Skin Depth of RF at this frequency?

Assume $\sigma_{A\mu}$ = 4e7 Siemens/meter at cavity operating temperature.

(a) 2 μm
(b) $(2.5/\pi)$ μm
(c) 0 μm
(d) None of the above

28. Which of the following Oscillation types this waveform represents when the difference between input frequency and natural frequency is small? Assume the generating system to be a lossless mechanical system.



(a) Damped Forced Oscillation (b) Undamped Forced Vibration
(c) Damped Vibration (d) None of the above

29. Identify the correct sequence of stages in charging of a Lead-Acid battery.
(a) Constant Current, Topping, Float (b) Topping, Constant Current, Float
(c) Float, Topping, Constant Current (d) Float, Constant Current, Topping

30. A rocket with lift-off mass of m_0 is launched from ground level. During flight, fuel burns at a constant rate for τ seconds and exhaust gases are ejecting from the bottom of the rocket at β Kg/sec with speed of c m/s relative to the rocket. Ignoring air resistance and assume acceleration due to gravity, g as constant, which of the following expression represents velocity of rocket v(t).

(a) $-c\ln\left[\frac{m_0-\beta t}{m_0}\right]-gt$ (b) $-c\ln\left[\frac{m_0-\beta t}{m_0}\right]+gt$

(c) $-c\ln\left[\frac{m_0}{m_0-\beta t}\right]+gt$ (d) $-c\ln\left[\frac{\beta}{m_0-\beta t}\right]-gt$

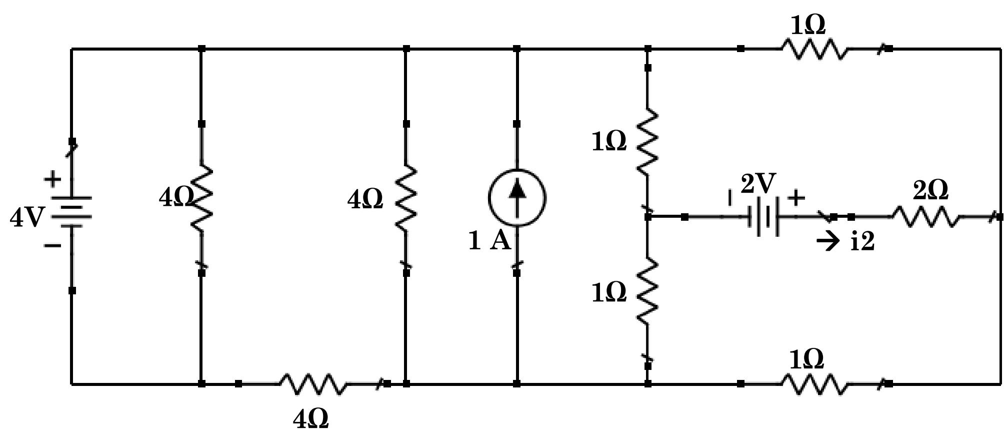
31. For a conservative vector field F below, which of the following is the scalar potential?
$F=(y^2Cosx+az^3)\vec{i}+(2ysinx-4)\vec{j}+(3xz^2+2)\vec{k}$
a is an integer
(a) Cannot be found (b) $xz^3+y^2\sin x-4y+2z$
(c) $2yCosx-y^2Sinx-2y+4z$ (d) $2ySinx-z^2Cosx-2y+4z$

32. A cylindrical waveguide with radius of 3.5 cm has waves travelling in TM_{12} mode. The value of 1st zero of 2nd order Bessel function is 7. Find the cut-off wavelength for this mode.
(a) π cm (b) 1.5π cm
(c) 2π cm (d) $\pi/2$ cm

33. A resistor R1 = 4 kΩ is connected across the secondary of transformer for which L1 = 0.2H, L2 = 10H and flux coupling coefficient k = 0.5. Find the peak voltage across resistor R1 when 250V peak voltage at 400 rad/sec is applied to primary winding of transformer.

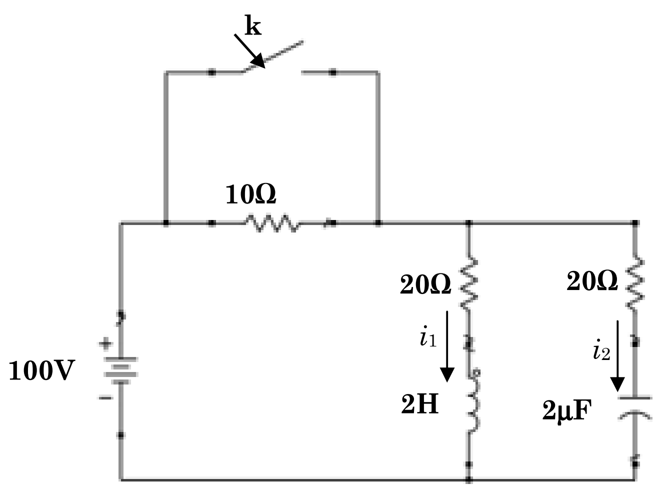
(a) 353.55 V (b) 500 V
(c) 707 V (d) 1000 V

34. For a network shown in figure, Calculate current i2.



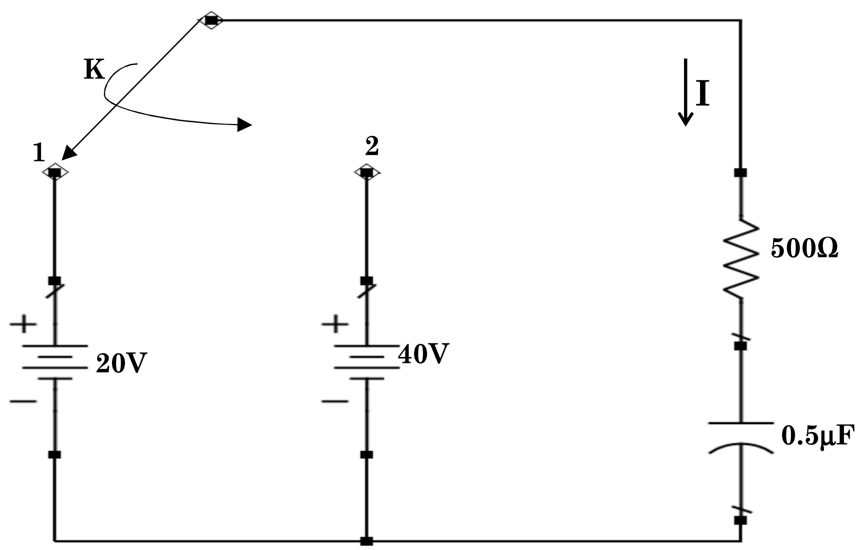
(a) 2/3 A (b) 3/2 A
(c) 1/3 A (d) None of the above

35. For a network shown in figure, a steady state is reached with switch k is open. Switch is closed at time t = 0. Calculate (di_1/dt) and (di_2/dt) at t = 0+



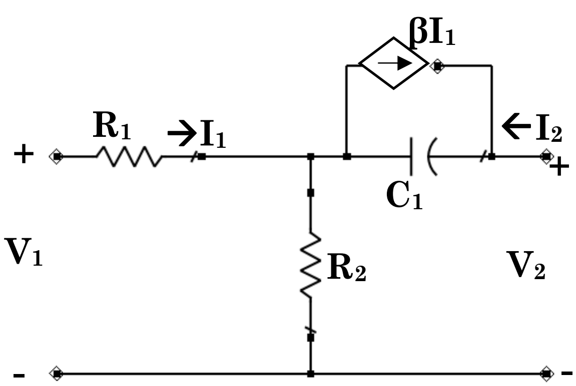
(a) 16.67 A/sec and -4.16×10^4 A/sec (b) 16.67 A/sec and -3.33×10^4 A/sec
(c) 25 A/sec and -4.16×10^4 A/sec (d) 25 A/sec and -3.33×10^4 A/sec

36. For a circuit given in figure, switch K is closed to position 1 at t = 0. After t = 1 TC (Time Constant), switch is moved to position 2. Find The Current I at 1TC(-) (just before one-time constant time) and 1TC(+) (just after one-time constant time) respectively (assume $1/e \simeq 0.37$)



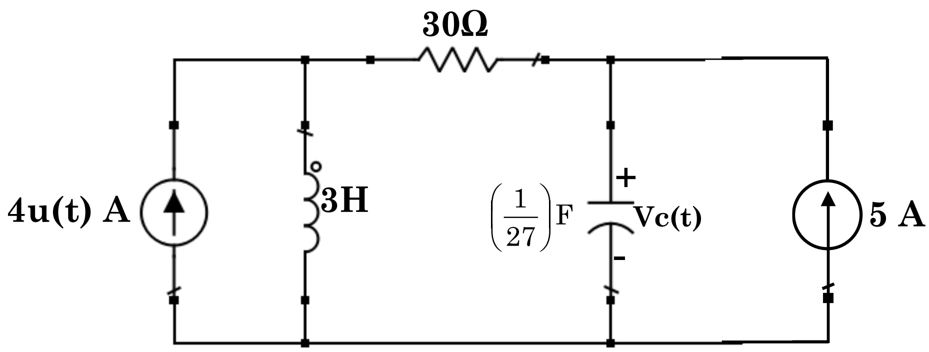
(a) 0.0148 A and 0.055 A (b) 0.0148 A and –0.055 A
(c) 0.0296 A and 0.11 A (d) 0.0296 A and –0.11 A

37. For a network shown in figure, which of the following statement is true.



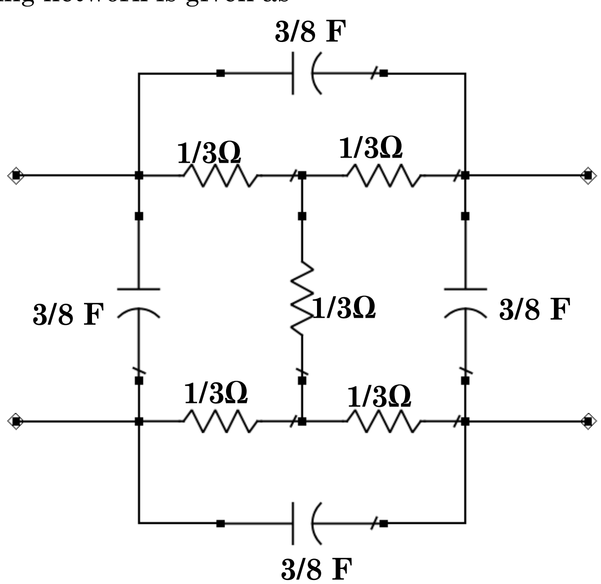
(a) Reciprocal and symmetric (b) Reciprocal but not-symmetric
(c) Symmetric but non-reciprocal (d) Neither symmetric nor reciprocal

38. A steady state is achieved in following Network at t = 0, find the time when Vc(t) will be maximum



(a) ln(9) sec
(b) $\ln(9)^{0.125}$ sec
(c) $\ln(9)^{0.25}$ sec
(d) 9 sec

39. Y-parameter for following network is given as



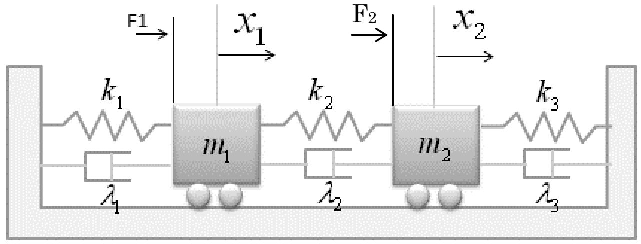
(a) $\begin{bmatrix} \frac{9(s+1)}{8} & \frac{-3(2s+2)}{8} \\ \frac{-3(2s+2)}{8} & \frac{9(s+1)}{8} \end{bmatrix}$

(b) $\begin{bmatrix} \frac{9(2s+1)}{8} & \frac{-3(2s+1)}{8} \\ \frac{-3(2s+1)}{8} & \frac{9(2s+1)}{8} \end{bmatrix}$

(c) $\begin{bmatrix} \frac{9(2s+1)}{8} & \frac{-3(2s+1)}{16} \\ \frac{-3(2s+1)}{16} & \frac{9(2s+1)}{8} \end{bmatrix}$

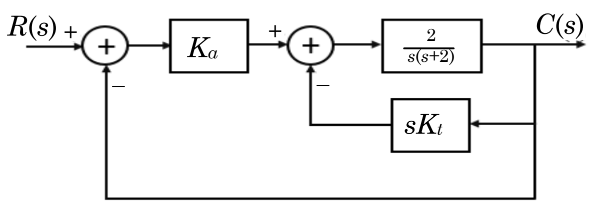
(d) $\begin{bmatrix} \frac{9(s+1)}{8} & \frac{-3(2s+1)}{8} \\ \frac{-3(2s+1)}{8} & \frac{9(s+1)}{8} \end{bmatrix}$

40. Consider a mechanical system shown in figure. Masses are free to slide over frictionless horizontal surface. The equation of motion of mass m_1 is



(a) $m_1\ddot{x}_1 + (\lambda_1 + \lambda_2)\dot{x}_1 + \lambda_2\dot{x}_2 - (k_1 + k_2)x_1 - k_2x_2 = F_2$
(b) $m_2\ddot{x}_1 + (\lambda_1 - \lambda_2)\dot{x}_1 + \lambda_2\dot{x}_2 - (k_1 - k_2)x_1 - k_2x_2 = F_1$
(c) $m_1\ddot{x}_1 + (\lambda_1 + \lambda_2)\dot{x}_1 - \lambda_2\dot{x}_2 + (k_1 + k_2)x_1 - k_2x_2 = F_1$
(d) $m_1\ddot{x}_1 + (\lambda_1 - \lambda_2)\dot{x}_1 + \lambda_2\dot{x}_2 - (k_1 - k_2)x_1 - k_2x_2 = F_2$

41. For a feedback system shown below, If K_t = 0 and K_a = 5, then steady state error for unit ramp input is 0.2. What will be the new value of K_t and K_a if damping ratio is increased to 0.5 without affecting steady state error:



(a) $K_t = 1.5$, $K_a = 1.25$
(b) $K_t = 1.5$, $K_a = 12.5$
(c) $K_t = 15$, $K_a = 12.5$
(d) $K_t = 15$, $K_a = 1.25$

42. For a negative unity feedback system, Gain is given by

$$G(s) = 0.25/((s^2+1)(8s+3))$$

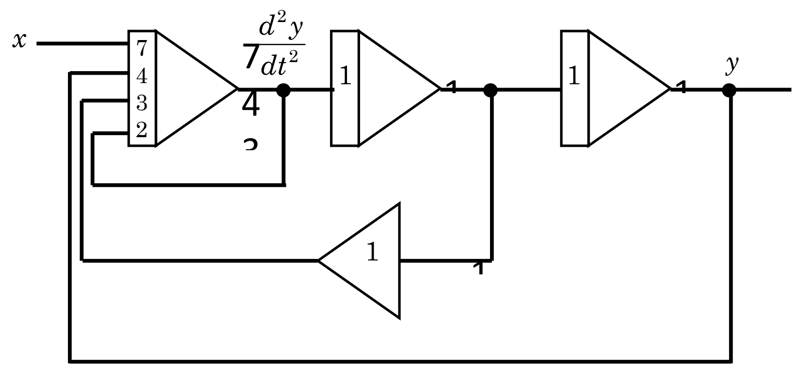
Transfer function of a lead compensator aimed at achieving gain crossover frequency of 0.5rad/sec and phase margin of 30 deg is

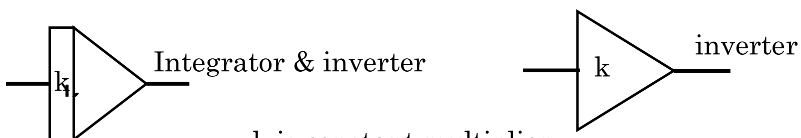
(a) $5\left[\frac{\sqrt{3}s + 0.5}{s + 0.5\sqrt{3}}\right]$
(b) $5\left[\frac{\sqrt{3}s - 0.5}{s - 0.5\sqrt{3}}\right]$
(c) $\left[\frac{\sqrt{3}s + 0.5}{s + 0.5\sqrt{3}}\right]$
(d) $\left[\frac{0.5s + \sqrt{3}}{s + 0.5\sqrt{3}}\right]$

43. A sensitivity of transfer function $T = (A_1 + kA_2)/(A_3 + kA_4)$ with respect to parameter k is given by

(a) $k(A_2A_3 - A_1A_4)/((A_3 + kA_4)(A_1 + kA_2))$
(b) $(A_2A_3 - A_1A_4)/((A_3 + kA_4)^2)$
(c) $k(A_2A_3 - A_1A_4)/((A_3 + kA_4)^2)$
(d) $(A_2A_3 - A_1A_4)/((A_3 + kA_4)(A_1 + kA_2))$

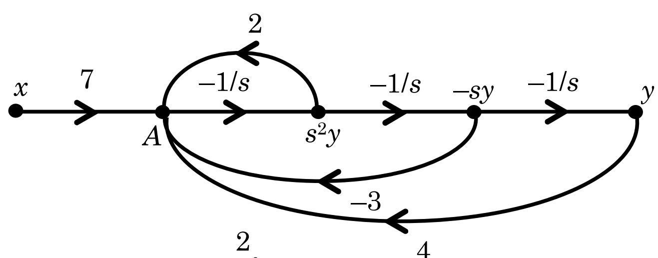
44. Signal flow diagram of following analog computer circuit is



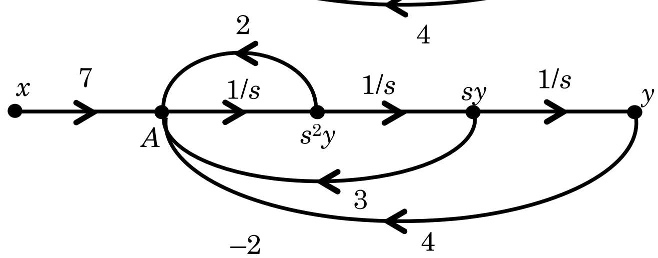


k is constant multiplier

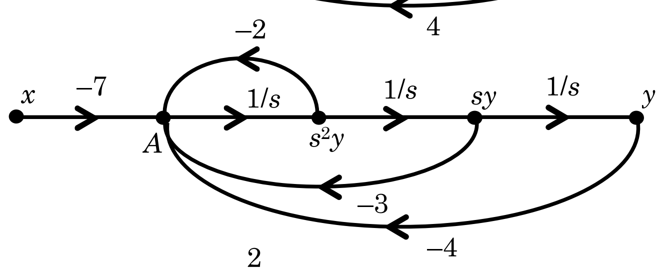
(a)



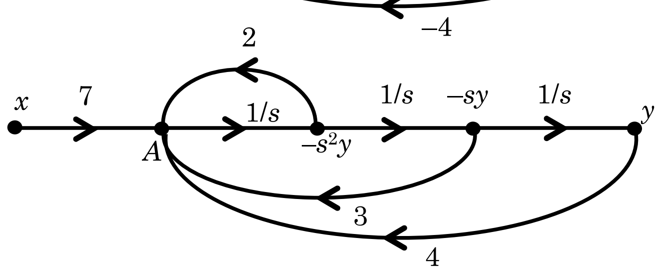
(b)



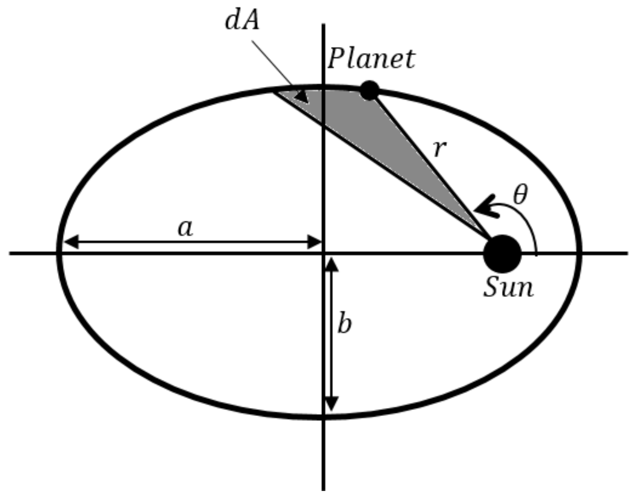
(c)



(d)



45. Pair of differential equations that describes motion of planet about sun using first two laws of Kepler is given as :



(a) $2\dot{r}\dot{\theta}+r\ddot{\theta}=0$ and $\ddot{r}+r\dot{\theta}^2\left(r\dfrac{a}{b^2}-1\right)=0$

(b) $2\dot{r}\dot{\theta}+r\ddot{\theta}=0$ and $\ddot{r}+r\dot{\theta}^2\left(r\dfrac{a}{b^2}+1\right)=0$

(c) $2\dot{r}\dot{\theta}-r\ddot{\theta}=0$ and $\ddot{r}-r\dot{\theta}^2\left(r\dfrac{a}{b^2}-1\right)=0$

(d) $2\dot{r}\dot{\theta}-r\ddot{\theta}=0$ and $\ddot{r}-r\dot{\theta}^2\left(r\dfrac{a}{b^2}+1\right)=0$

46. Two communication antennas A and B, one operating at 300 MHz and other at 3 GHz respectively and having same gain, are illuminated with identical flux density of –100 dBW/m^2. What is the relation between the received powers ($P_A : P_B$)?

(a) 1:10 (b) 10:1

(c) 1:100 (d) 100:1

47. Consider identical four, 3-faced dice. When the dice are rolled, the faces of the dice appear with probabilities given below. Which distribution has the maximum entropy?

(a) (1/2, 1/4, 1/4) (b) (1/3, 1/3, 1/3)

(c) (1/6, 2/3, 1/6) (d) (1/4, 1/6, 7/12)

48. A satellite transmits signals at a frequency of 6 GHz to a user 40000 km away. The free space path loss incurred by the signal is nearly :

(a) 100 dB (b) 150 dB
(c) 200 dB (d) 300 dB

49. The satellite communication link between two point is established with uplink carrier-to-noise ratio of 20 dB and downlink carrier to noise ratio of 14 dB. The overall C/N is close to :

(a) 34 dB (b) 6 dB
(c) 13 dB (d) 13.5 dB

50. A system generates data at a rate of 5 Mbps. In order to provide resistance to bit errors, a rate $1/2$ error correcting code is applied. Further, the data is mapped to a 16-QAM constellation. What is the resulting symbol rate?

(a) 1.25 Msps (b) 2.5 Msps
(c) 5 Msps (d) 10 Msps

51. Consider a binary linear code with parity check matrix H given below.

$$H = \begin{bmatrix} 0 & 1 & 1 & 1 & 0 & 0 \\ 1 & 0 & 1 & 0 & 1 & 0 \\ 1 & 1 & 0 & 0 & 0 & 1 \end{bmatrix}$$

Which of the following is a valid codeword?

(a) [1 0 0 1 0 1] (b) [1 1 1 1 0 1]
(c) [0 1 0 0 1 0] (d) [1 1 0 1 1 0]

52. The minimum distance of a (n,k) = (7,4) linear block code is upper bounded by:

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

53. Consider a 4-PSK constellation with points $\{\sqrt{2}, j\sqrt{2}, -\sqrt{2}, -j\sqrt{2}\}$ and a 4-PAM constellation $\{-3,-1,1,3\}$. If all the points in the constellation occur with equal probability, the ratio of average energy of 4-PAM signal to that of 4-PSK signal is:

(a) 1 (b) 1.25
(c) 2.5 (d) 5

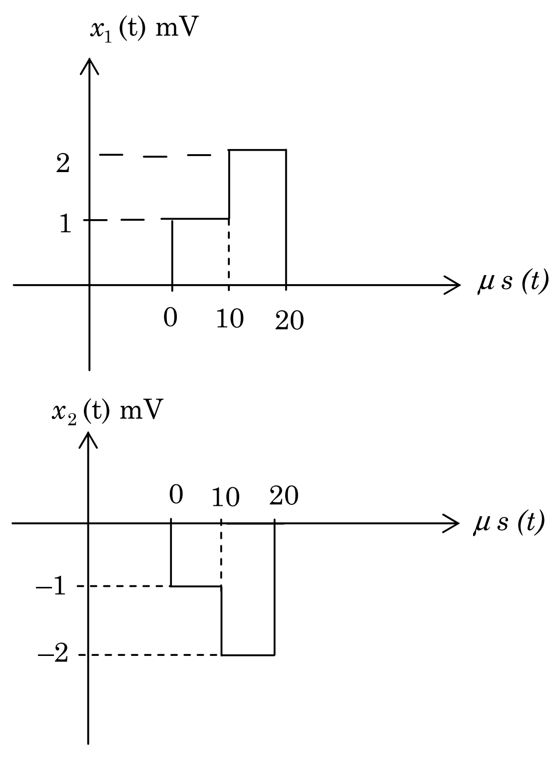
54. If over the course of a day, the maximum electron density in the ionosphere varies from 10^{11} to 10^{12} m^{-3}; the critical frequency changes approximately from:

(a) 2.2 MHz to 7 MHz
(b) 2.5 MHz to 8 MHz
(c) 2.8 MHz to 9 MHz
(d) 3.2 MHz to 10 MHz

55. What is the peak to average power ratio for the signal $x(t) = A\sin(\omega t)$ with 50% duty cycle?

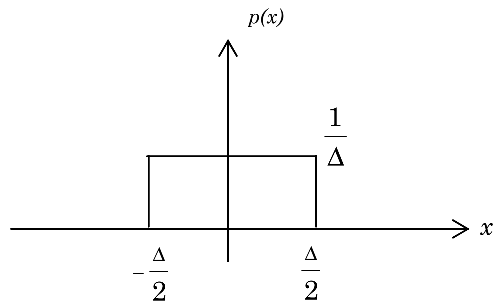
(a) 0 dB
(b) 1 dB
(c) 3 dB
(d) 6 dB

56. A binary communication system receives equally likely symbols $x_1(t)$ and $x_2(t)$ plus Additive White Gaussian Noise at the input of matched detector. If the noise power spectral density (N_0) is 10^{-11} W/Hz, compute E_b/N_0 (in dB). Assume system characteristics impedance as 1 Ω.



(a) 3 dB
(b) 4 dB
(c) 7 dB
(d) 10 dB

57. Find the variance of the distribution shown in the figure.



(a) $\frac{\Delta^2}{2}$ (b) $\frac{\Delta^2}{4}$

(c) $\frac{\Delta^2}{8}$ (d) $\frac{\Delta^2}{12}$

58. Fourier transform of $te^{-at}u(t)$, (where, a>0, u(t) is the Unit step function) is:

(a) $\frac{a}{(a+j2\pi f)^2}$ (b) $\frac{1}{(a+j2\pi f)^2}$

(c) $\frac{a}{(a+j2\pi f)}$ (d) $\frac{1}{(a+j2\pi f)}$

59. Consider waveforms $\cos(2\pi f_1 t+\theta)$ and $\cos(2\pi f_2 t)$, $(f_1 > f_2)$, to be used for non-coherent binary FSK signalling. If the symbol duration is T seconds, and θ is constant arbitrary angle from 0 to 2π, what is the minimum separation required between f_1 and f_2 for non-coherent, orthogonal FSK?

(a) $f_1 - f_2 = \frac{1}{T}$ (b) $f_1 - f_2 = \frac{2}{T}$

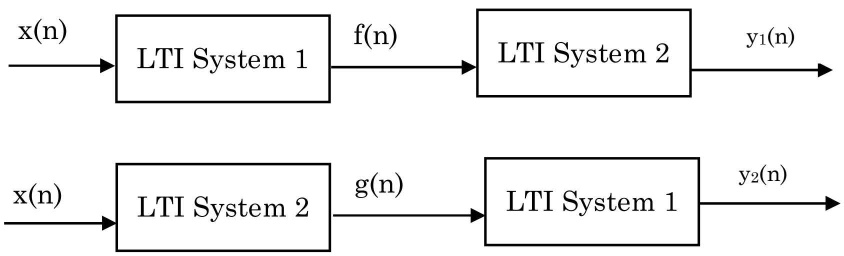
(c) $f_1 - f_2 = \frac{1}{4T}$ (d) $f_1 - f_2 = \frac{1}{3T}$

60. Let $X(e^{j\omega}) = \sum_{n=-\infty}^{\infty} x[n]e^{-j\omega n}$ and $x[n] = \frac{1}{2\pi}\int_{-\pi}^{\pi} X(e^{j\omega})e^{j\omega n}d\omega$. If $X(e^{j\omega}) = \frac{1}{(1-0.2e^{-jw})(1-0.1e^{-j\omega})}$, what is $x[n]$ in terms of unit discrete step function $u(n)$?

(a) $2(0.2)^n u(n) - (0.1)^n u(n)$ (b) $2(0.1)^n u(n) - (0.2)^n u(n)$

(c) $(0.2)^n u(n) - (0.1)^n u(n)$ (d) $(0.1)^n u(n) - (0.2)^n u(n)$

61.



If System 1 and 2 are Linear Time Invariant systems and same input x(n) is provided both configuration

Statement 1: $y_1(n) = y_2(n)$

Statement 2: f(n)=g(n)

(a) Statement 1 is always true

(b) Statement 2 is always true

(c) Both Statement 1 and Statement 2 are always true

(d) Both Statement 1 and statement 2 are not true

62. Benefit(s) of Bandpass sampling over low pass sampling

(a) It reduces speed requirement of A/D convertor

(b) Increase the amount of digital memory necessary to capture a given interval of signal

(c) Both (a) and (b) are correct

(d) Both (a) and (b) are incorrect

63. For a signal with F_c (Centre Frequency) = 1200 MHz and BW= 100 MHz which of the following Sampling frequency(F_s) will cause spectrum inversion:

(a) 287.5 MHz (b) 575 MHz

(c) 1150 MHz (d) 1600 MHz

64. If $x_{in}(t) = \sin(2 * \pi * 4000 * t) + 0.75 * \sin(2 * \pi * 5000 * t + \pi / 4)$ is sampled with $F_s = 16000\, Hz$ calculate $X(0)$ if $X(m) = \sum_{n=0}^{N-1} x(n) e^{-j2\pi nm/N}$ When $N = 8$, where $x(n) = x_{in}(nt_s)$

(a) 0.0 – j 4.0 (b) 0.0 – j 0.0

(c) 1.414 + j 1.414 (d) 0.0 + j 4.0

65. Difference in number of complex multiplier required for 16 point DFT and 16-point radix-2 FFT is

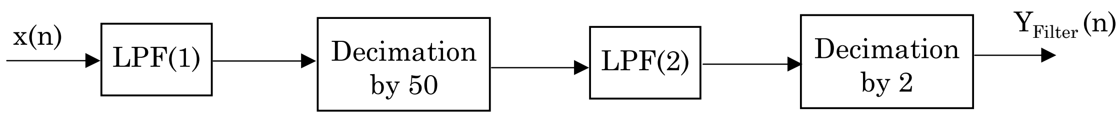
(a) 30 (b) 63 (c) 224 (d) 256

66. No of stages(S) in direct form FIR filter is given as

S=integer (K*Fs / Δf)

Where Fs = Sampling Frequency, Δf = Filter transition band, K= 3 (assume)

If x(n) is signal with frequency range 0-2.4 MHz and sampled at F_s = 400 MHz and it is filtered by



Assumptions :

- Passband Frequency LPF(1): 1.8 MHz, Stopband Frequency LPF(1): 4 MHz
- Passband Frequency LPF(2): 1.8 MHz ,Stopband Frequency LPF(2): 2 MHz
- Both filters are having flat passbands and stopbands
- Passband attenuation of both filters = 0 dB and stop band attenuation of both filters is infinity.

Calculate total no. of stages $S_{LPF1} + S_{LPF2}$

(a) 120 (b) 545 (c) 555 (d) 665

67. Difference in dynamic range of 32-bit binary number(B) and floating point number(F) is? Standard Format for B and F as given below :

B=

Bit 31 Sign Bit	Bit 30-Bit0 Magnitude

F=

Bit 31 Sign Bit	Bit 30-Bit23 Exponent	Bit 22-Bit0 fraction

(a) 6.02(2^7-30) dB (b) 6.02(2^8-31) dB (c) 6.02(2^7-31) dB (d) 6.02(2^8-30) dB

68. x(t) = {
    1, $0 \le t \le T$
    0, otherwise
    }
    h(t) = {
    t, $0 \le t \le 2T$
    0, otherwise
    }

    Calculate y(t) = x(t) * y(t), where * denotes convolution for interval $T \le t \le 2T$

    (a) 0 (b) $0.5t^2$ (c) $Tt - 0.5T^2$ (d) $-0.5t^2 + Tt + 2.5T^2$

69. Which of these is non-operational attribute of embedded system?

    (a) Response (b) Throughput (c) Security (d) Portability

70. For the below mentioned 8051 assembly code

Time elapse	:	MOV R0, #100
Part 1	:	MOV R1, #50
Part 2	:	MOV R2,#248
Part 3	:	DJNZ R2, Part3
	:	DJNZ R1, Part2
	:	DJNZ R0, Part 1

Assumptions :

- Microcontroller is running at 12 MHz frequency and 1 machine cycle is having 12 clock cycles
- MOV instruction takes 1 Machine cycle
- DJNZ instruction takes 2 Machine cycle

Calculate time required for execution of Part 1

(a) 2495600 μs (b) 2496300 μs (c) 2495300 μs (d) 2496600 μs

71. A. Program Counter(PC) Pushed to Stack
    B. Generate LCALL to ISR
    C. Complete Execution of instruction in progress
    D. Clear the interrupt flag
    E. Set interrupt in progress

    Correct order of execution of action taken by 8051 micro-controllers when an interrupt occurs:

    (a) C, A, D, E, B (b) A, B, D, E, C (c) C, D, B, E, A (d) A, C, B, D, E

72. What is the content of Accumulator in binary after execution of following 8051 Assembly code :

```
MOV A, #27H
MOV R1, A
SWAP A
ANL A, # 0FH
MOV B, #10
MUL AB
MOV R2, A
MOV A, R1
ANL A, #0FH
ADD A, R2
```

(a) 00100111 (b) 01110010 (c) 01010101 (d) 11001011

73. In a 16-Bit micro-controller if a two-dimensional integer array A[5][7] is stored at base location 0x8000, What is the address of A[4][2]?

(a) 0x800C (b) 0x803E (c) 0x801F (d) 0x8400

74. Content of variable flag after following 'C' code execution:

```
Unsigned char flag = 0x7C;
flag=flag|0x80;
flag=flag|(1<<4);
flag&=~(1<<7);
flag^=(1<<6);
```

(a) 0x1C (b) 0x20 (c) 0x24 (d) 0x3C

75. Process P1, P2 and P3 with execution time of 6 ms, 4 ms and 2 ms respectively enter in ready state together in order P1, P2, P3. Calculate the waiting and turnaround time of Process P1. Assuming no wait time due to I/O and round robin scheduling with time slot of 2 ms.

(a) 6 ms, 12 ms (b) 6 ms, 10 ms (c) 4 ms, 4 ms (d) 4 ms, 6 ms

76. A. HDL Coding /RTL Design
B. Synthesis
C. Static Timing Analysis
D. Place and Route
E. Programming file generation

What is the correct order of FPGA design flow?

(a) A,B,C,D,E (b) A,B,D,C,E (c) B,D,C,E,A (d) C,A,D,E,B

77. VHDL

```
entity test is
port
(
data  : in std_logic;
clk   : in std_logic;
reset : in std_logic;
q     : out std_logic
);
end test;
architecture behav of test is
begin
process (clk)
begin
    if (clk'event and clk = '1') then
        if (reset = '0') then
            q <= '0';
    else
        q <= data;
    end if;
  end if;
end process;
end behav;
```

VERILOG

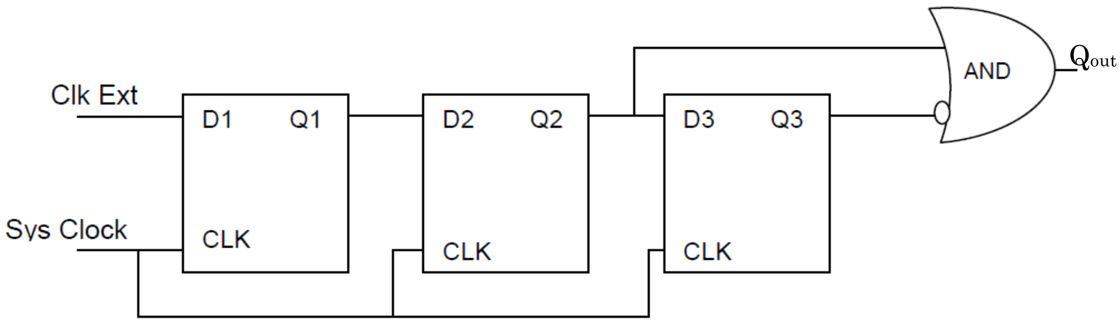
```
module test (data, clk, reset, q);
input data, clk, reset;
output q;
reg q;

always @ (posedge clk)
if (~reset)
q = 1'b0;
else q = data;
endmodule
```

The Above Verilog/ VHDL module depicts which sequential element:

(a) Rising edge Flip-flop with synchronous Reset
(b) Falling edge Flip-Flop with synchronous Reset
(c) Rising edge Flip-flop with asynchronous Reset
(d) Falling edge Flip-Flop with asynchronous Reset

78.



If Sys clock frequency is > 4 * clk_ext frequency. What is the functionality of above circuit?

(a) Falling Edge detector with Pulse width of Q_{out} = one cycle of Sys clk

(b) Rising Edge detector with Pulse width of Q_{out} = one cycle of Sys clk

(c) Falling Edge detector with Pulse width of Q_{out} = one cycle of clk_ext

(d) Rising Edge detector with Pulse width of Q_{out} = one cycle of clk_ext

79. Simplify the Boolean expression :

F(w,x,y,z) = ∑(0,1,2,4,5,6,8,9,12,13,14)

(a) w+x+y+z (b) y' + w'z'+xz'

(c) y + w'z'+xz (d) x+z'w'y+x'

80. High State noise margin of standard TTL and 5V CMOS logic gate are

(a) 0.4V, 0.4V (b) 0.4V, 1V

(c) 1V, 0.4V (d) 1V, 1V