# QUESTION BANK

**1.** Which of the following signals is/ are periodic?

(a) $x(t) = \cos 2t + \cos 3t + \cos 5t$

(b) $x(t) = \exp(j8\pi t)$

(c) $x(t) = \exp(-7t) \sin 10\pi t$

(d) $x(t) = \cos 2t \cos 4t$

**2.** ***Assertion (A) :*** An LTI discrete system represented by the difference equations $y(n + 2) - 5y(n + 1) + 6y(n) = x(n)$ is unstable

***Reason (R):*** A system is unstable if the roots of the characteristic equation lie outside the unit circle.

(a) Both A and R are true and R is the correct explanation of A

(b) Both A and R are true but R is NOT the correct explanation of A

(c) A is true but R is false

(d) A is false but R is true

**3.** Consider a random sinusoidal signal $x(t) = \sin(\omega_0 t + \phi)$ where a random variable '$\phi$' is uniformly distributed in the range $+\pi/2$. The mean value of x(t) is

(a) zero  (b) $\frac{2}{\pi}\sin(\omega_0 t)$

(c) $\frac{2}{\pi}\cos(\omega_0 t)$  (d) $\frac{2}{\pi}$

**4.** The function $\delta(2n)$ is equal to

(a) $\delta(n)$  (b) $\frac{1}{2}\delta(n)$

(c) $2\delta(n)$  (d) $2\delta\left(\frac{n}{2}\right)$

**5.** Let $\delta(t)$ 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) $\frac{\pi}{2}$

**6.** If a signal f(t) has energy E, the engergy of the singal f(2t) is equal to

(a) E  (b) E / 2

(c) 2E  (d) 4E

**7.** If a function f(t) u(t) is shifted to right side by $t_0$, then the function can be expressed as

(a) $f(t-t_0)u(t)$  (b) $f(t)u(t-t_0)$

(c) $f(t-t_0)u(t-t_0)$  (d) $f(t+t_0)u(t-t_0)$

**8.** The color T.V. picture signal is a

(a) Single-channel, one-dimensional signal

(b) single-channel, three dimensional signal

(c) three-channel, one-dimensional signal

(d) three-channel, three-dimensional signal

**9.** Consider the signals $x_1(t) = 2\sin \pi t + \cos 4\pi t$ and $x_2(t) = 2\sin 5\pi t + 3\sin 13\pi t$ -

(a) Both the signals are periodic

(b) Both the signals are not periodic

(c) $x_1$ is periodic, but $x_2$ is not periodic

(d) $x_1$ is not periodic, but $x_2$ is periodic

**10.** The sum of two or more arbitrary sinusoids is

(a) always periodic

(b) Periodic under certain conditions

(c) Never periodic

(d) Periodic only if all the sinusoids are identical in frequency and phase

**11.** Which one of the following must be satisfied if a signal is to be periodic for $-\infty < t < \infty$ ?

(a) $x(t+T_0) = x(t)$

(b) $x(t+T_0) = dx(t)/dt$

(c) $x(t+T_0) = \int_{t}^{T_0} x(t)\,dt$

(d) $x(t+T_0) = x(t) + kT_0$

**12.** The average value of the wave form x(t)=4t–5 sin 5t is

(a) 0 (b) –2/π

(c) 2/π (d) 20/π

**13.** Consider the sequence x[n] = [–4 – j5  1 + $\underset{\uparrow}{}$j2  4]. The conjugate anti-symmetric part of the sequence is

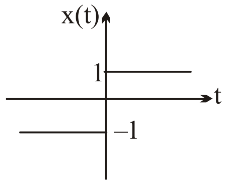
(a) [–4 – j2.5  j2  4 – j2.5]

(b) [–j2.5  1  j2.5]

(c) [–j5  j2  0]

(d) [–4  1  4]

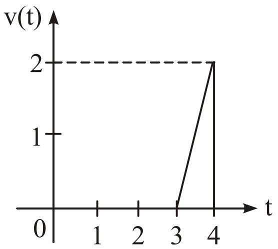
**14.** The function x(t) is shown in figure even and odd parts of a unit-step function u(t) are respectively.




(a) $\frac{1}{2}, \frac{1}{2}x(t)$ (b) $-\frac{1}{2}, \frac{1}{2}x(t)$

(c) $\frac{1}{2}, -\frac{1}{2}x(t)$ (d) $-\frac{1}{2}, -\frac{1}{2}x(t)$

**15.** In the graph shown below, which one of the following express v(t)?




(a) $(2t+6)[u(t-3)+2u(t-4)]$

(b) $(-2t-6)[u(t-3)+u(t-4)]$

(c) $(-2t+6)[u(t-3)+u(t-4)]$

(d) $(2t-6)[u(t-3)-u(t-4)]$

**16.** A signal v(n) is defined by

$$v[n] = \begin{cases} 1 & ; \quad n = 1 \\ -1 & ; \quad n = -1 \\ 0 & ; \quad n = 0 \text{ and } |n| > 1 \end{cases}$$

Which is the value of the composite signal defined as v[n] + v[–n]?

(a) 0 for all integer values of n

(b) 2 for all integer values of n

(c) 1 for all integer values of n

(d) –1 for all integer values of n

**17.** What is sinc (t)* sinc (t) equal to?

(a) δ(t) (b) u(t)

(c) Rect (t) (d) sinc (t)

**18.** ***Assertion (A) :*** If two signals are orthogonal they will also the orthonormal.

***Reason (R) :*** If two signals are orthonormal they also will be orthogonal.

(a) Both A and R individually true and R is the correct explanation of A

(b) Both A and R are individually true but R is not the correct explanation of A

(c) A is true but R is false

(d) A is false but R is true

**19.** The Dirac delta function δ(t) is defined as

(a) $\delta(t) = \begin{cases} 1 & t = 0 \\ 0 & \text{otherwise} \end{cases}$

(b) $\delta(t) = \begin{cases} \infty & t = 0 \\ 0 & \text{otherwise} \end{cases}$

(c) $\delta(t) = \begin{cases} 1 & t = 0 \\ 0 & \text{otherwise} \end{cases}$ and $\int_{-\infty}^{\infty} \delta(t)dt = 1$

(d) $\delta(t) = \begin{cases} \infty & t = 0 \\ 0 & \text{otherwise} \end{cases}$ and $\int_{-\infty}^{\infty} \delta(t)dt = 1$

**20.** The following is true

(a) A finite signal is always bounded

(b) A bounded signal always possesses finite energy

(c) A bounded signal is always zero outside the interval ($-t_0$, $t_0$) for some $t_0$.

(d) A bounded signal is always finite

**21.** Consider two signals $x_1(t) = e^{j20t}$ and $x_2(t) = e^{(-2+j)t}$.

Which one of the following statements is correct?

(a) Both $x_1(t)$ and $x_2(t)$ are periodic

(b) $x_1(t)$ is periodic but $x_2(t)$ is not periodic

(c) $x_2(t)$ is periodic but $x_1(t)$ is not periodic

(d) Neither $x_1(t)$ nor $x_2(t)$ is periodic

**22.** If v-i characteristic of a circuit is given by v(t) = ti(t) + 2, the circuit is of which type?

(a) Linear and time invariant

(b) Linear and time varaint

(c) Non-linear and time invariants

(d) Non-linear and time variant

**23.** Which one of the following function is a periodic one?

(a) $\sin(10\pi t) + \sin(20\pi t)$

(b) $\sin(10t) + \sin(20\pi t)$

(c) $\sin(10\pi t) + \sin(20t)$

(d) $\sin(10t) + \sin(25t)$

**24.** A signal $x_1(t)$ and $x_2(t)$ constitute the real and imaginary parts respectively of a complex valued signal x(t). What form of waveform does x(t) possess?

(a) Real symmetric

(b) Complex symmetric

(c) Asymmetric

(d) Conjugate symmetric

**25.** If a random process X(t) is periodic then, statistical averages

(a) and time averages are different

(b) and time averages are same

(c) are greater than time averages

(d) are smaller than time averages

**26.** The system represented by the input-output relationship $y(t) = \int_{-\infty}^{5t} x(\tau)d\tau,\ t > 0$ is

(a) Linear and causal

(b) Linar but not causal

(c) Causal but not linear

(d) Neither linear nor causal

**27.** The period of the singnal $x(t) = 8\sin\left(0.8\pi t + \frac{\pi}{4}\right)$ is

(a) $0.4\ \pi s$ (b) $0.8\ \pi s$

(c) 1.25 s (d) 2.5 s

**28.** A signal f(t) is described as

$$f(t) = [t - |t|] \quad \text{when } |t| \le 1$$

$$= 0 \quad \text{when } |t| > 1$$

This represents the unit.

(a) sinc function

(b) area triangular function

(c) signum function

(d) parabolic function

**29.** Match List-I with List-II and select the correct answer using the code given below the lists:

| | List-I | | List-II |
|---|---|---|---|
| A. | Even signal | 1. | $x(n) = \left(\frac{1}{4}\right)^n u(n)$ |
| B. | Causal signal | 2. | $x(-n) = x(n)$ |
| C. | Periodic signal | 3. | $x(t)u(t)$ |
| D. | Energy signal | 4. | $x(n) = x(n+N)$ |

***Codes:***

| | A | B | C | D |
|---|---|---|---|---|
| (a) | 2 | 3 | 4 | 1 |
| (b) | 1 | 3 | 4 | 2 |
| (c) | 2 | 4 | 3 | 1 |
| (d) | 1 | 4 | 3 | 2 |

**30.** The period of the signal

$x(t) = 10\sin 12\pi t + 4\cos 18\pi t$ is

(a) $\frac{\pi}{4}$ (b) $\frac{1}{6}$

(c) $\frac{1}{9}$ (d) $\frac{1}{3}$

**31.** If, (i) $x_1(t) = 2\sin\pi t + \cos 4\pi t$

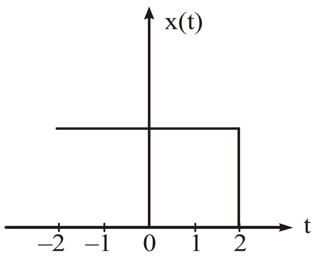
(ii) $x_2(t) = \sin 5\pi t + 3\sin 13\pi t$

Which of the above are periodic ?

(a) (i) only (b) (ii) only

(c) both (i) and (ii) (d) none of the above

**32.** The mathematical model of the below shown signal is



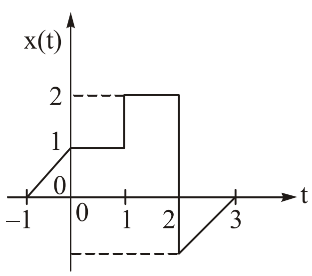

(a) $x(t) = u(2+t)$

(b) $x(t) = u(t-2)$

(c) $x(t) = u(2-t)$

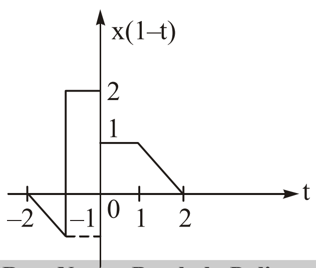
(d) $x(t) = u(t-1)$

**33.** If a plot of signal x(t) is as shown in the figure-1.

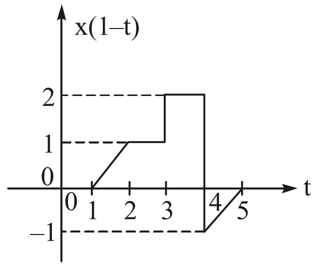



then the plot of the signal x(1 – t) will be

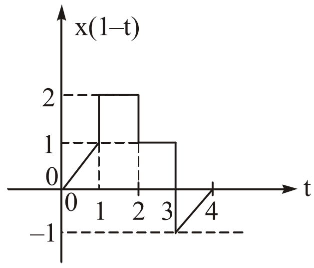
(a)



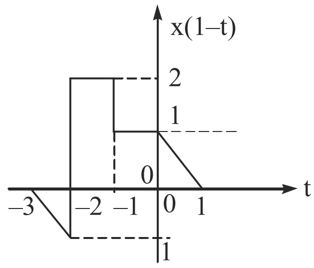

(b)



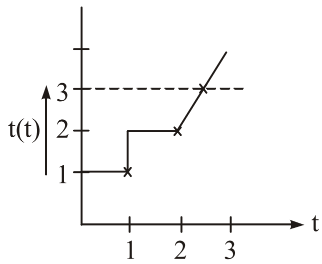

(c)




(d)




**34.** Consider the following waveform diagram




Which one of the following gives the correct description of the waveform shown in the above diagram?

(a) $u(t) + u(t-1)$

(b) $u(t) + u(t-1)u(t-1)$

(c) $u(t) + u(t-1)u(t-2)u(t-2)$

(d) $u(t) + (t-2)u(t-2)$

**35.** x[n] is defined as

$$x[n]=\begin{cases}0 & \text{for } n<-2 \text{ or } n>4\\ 1, & \text{otherwise}\end{cases}$$

Determine the value of n for which x[–n–2] is guaranteed to be zero.

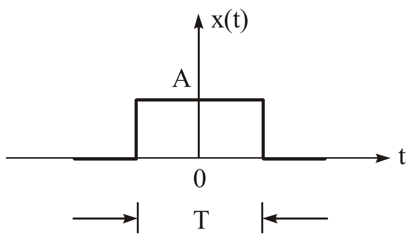
(a) n < 1 and n > 7

(b) n < –4 and n > 2

(c) n < –6 and n > 0

(d) n < –2 and n > 4

**36.** What is the total energy of the rectangular pulse shown in the figure given above?




(a) AT (b) $A^2T$

(c) $A^2T^2$ (d) $AT^2$

***Linked Answer Question 37 & 38***

The impulse response h(t) of a linear time-invariant continuous time system is given by h(t) = exp(–2t) u (t), where u(t) denotes the unit step function.

**37.** What is the period of the sinusoidal signal $x(n)=5\cos[0.2\pi n]$?

(a) 10 (b) 5

(c) 1 (d) 0

**38.** If x(t) is a periodic signal with Fourier series coefficient $C_n$ and y(t) = x(at). The average powers in x(t) and y(t) are $P_x$ & $P_y$ respectively, then

(a) $P_y = aP_x$ (b) $P_y = a^2P(x)$

(c) $P_y = P(x)/a^2$ (d) $P_y = P_x$

**39.** ***Statement 1:*** $x[n]=\cos\left[\frac{1}{4}n\right]$ is non periodic.

***Statement 2:*** $x(t)=e^{i\left[\left(\frac{\pi}{2}\right)t-1\right]}$ is periodic.

Choose correct option

(a) Both statement are true

(b) Statement 1 is false, but statement 2 is true

(c) Statement 1 is true, but statement 2 is false

(d) Both statement are false

**40.** The discrete time signal x(n) is defined by

$$x(n)\begin{cases}1 & n=1\\ -1 & n=-1\\ 0 & n=0 \text{ and } |n|>1\end{cases}$$

Which one of the following is the composite signal y(n) = x(n) + x(–n) for all integer values of n?

(a) 0 (b) 2

(c) $\infty$ (d) $-\infty$

**41.** Match List-I (Characteristic of f(t)) with List-II (Functions) and select the correct answer using the codes given below the lists :

**List-I**

A. $f(t)(1-u(t))=0$

B. $\frac{f(t)+Kdf(t)}{dt}=0;K$ is a positive constant

C. $f(t)+K\frac{d^2f(t)}{dt^2}=0;\ K$ is a positive constant

D. $f(t)(g(t)-g(0))=0;$ for any arbitrary g(t)

**List-II**

1. Decaying exponential
2. Growing exponential
3. Impulse
4. Causal
5. Sinusoid

| *Codes:* | A | B | C | D |
|---|---|---|---|---|
| (a) | 4 | 1 | 5 | 3 |
| (b) | 1 | 4 | 5 | 3 |
| (c) | 4 | 2 | 5 | 1 |
| (d) | 2 | 5 | 4 | 1 |

**42.** Which one of the following is the mathematical representation for the average power of the signal x(t)?

(a) $\frac{1}{T}\int_{0}^{T} x(t)dt$  (b) $\frac{1}{T}\int_{0}^{T} x^2(t)dt$

(c) $\frac{1}{T}\int_{-T/2}^{T/2} x(t)dt$  (d) $\underset{T\to\infty}{Lt}\frac{1}{T}\int_{-T/2}^{T/2} x^2(t)dt$

**43.** Consider the continuous time single $x(t)=\delta(t+2)-\delta(t-2)$. The value of $E_\infty$ for the signal $y(t)=\int_{-\infty}^{1} x(\tau)d\tau$ is-

(a) 2  (b) 0

(c) 4  (d) 1

**44.** The fundamental period of the signal

$x[n]=1+e^{j4\pi n/7}-e^{j2\omega n/5}$ is

(a) 35  (b) 70

(c) 140  (d) 25

**45.** Which one of the following is correct? Energy of a power signal is

(a) finite  (b) zero

(c) infinite  (d) between 1 and 2

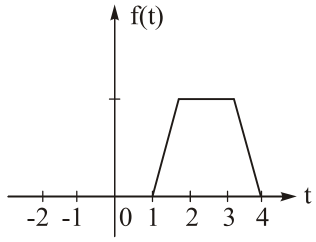
**46.** Given sinusoidal signal x(t) = cos(21t), with sampling interval $T_s$ such that $x[n] = x(nT_s)$ is a periodic sequence. The fundamental period is, it, $T_s = 0.3\pi$ sec

(a) 5  (b) 10

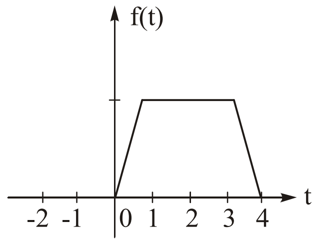
(c) 15  (d) 20

**47.** The signal $f(t)=(t-1)u(t-1)-(t-2)u(t-2)-u(t-4)$ shows figure below

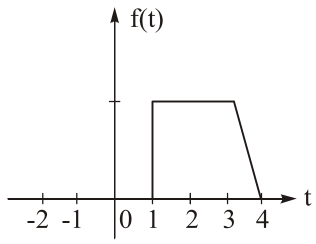
(a)



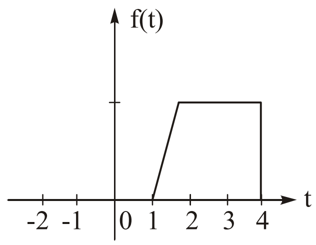

(b)



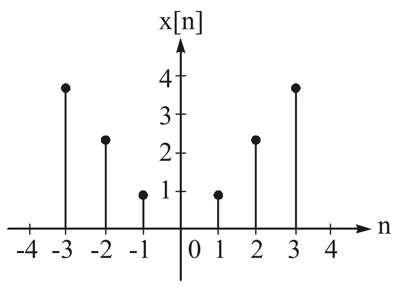

(c)

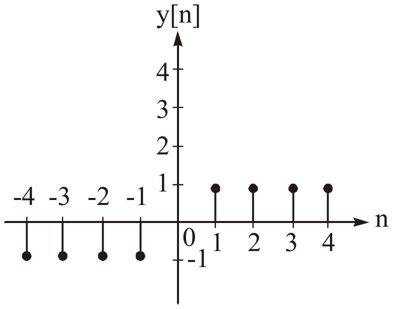



(d)

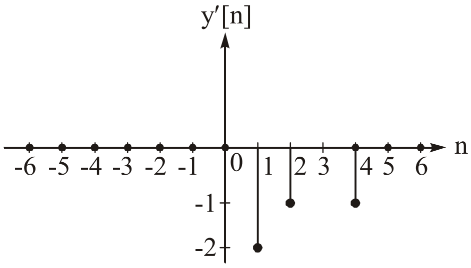



**48.** x[n] and y[n] are given below figure






the signal




represents.

(a) $y'[n] = x[n-3] \cdot y[-n]$

(b) $y'[n] = x[3-n] \cdot y[-n]$

(c) $y'[n] = x[-n-3] \cdot y[-n]$

(d) $y'[n] = x[3-n] \cdot y[-n]$

**49.** The signal $x(t) = A\cos(\omega t + \phi)$ is

(a) an energy signal

(b) a power signal

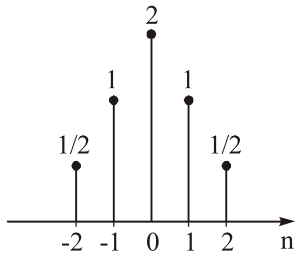
(c) an energy as well as a power signal

(d) neither an energy nor a power signal

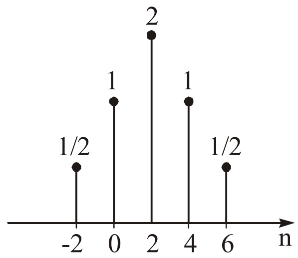
**50.** A sequency x(n) has non-zero values as shown in figure The sequence

$$y(n) = \left\{ x\left(\frac{n}{2} - 1\right) \right. \quad \text{for 'n' even}$$

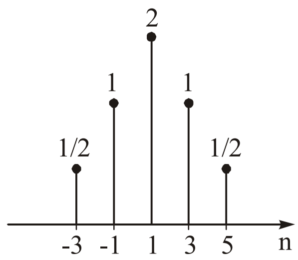
$$= 0, \text{for 'n' odd}$$




(a)




(b)

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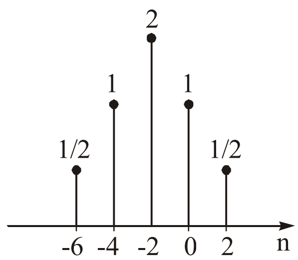
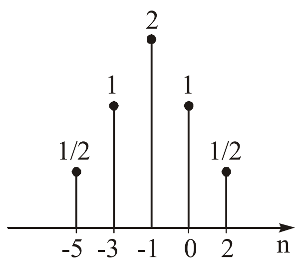



(d)

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## ANSWERS AND EXPLANATIONS

**1. *Ans. (a), (b), (c)***

(i) $x(t) = \cos 2t + \cos 3t + \cos 5t$

$x(t) = x_1(t) + x_2(t) + x_3(t)$

Where, $x_1(t) = \cos 2t = \cos \omega_1 t$

$\Rightarrow \quad \omega_1 = 2 = \frac{2\pi}{T_1}$ and $T_1 = \pi$

and $x_2(t) = \cos 3t = \cos \omega_2 t$

$\Rightarrow \quad \omega_2 = 3 = \frac{2\pi}{T_2}$ and $T_2 = \frac{2\pi}{3}$

and $x_3(t) = \cos 5t = \cos \omega_3 t$

$\Rightarrow \quad \omega_3 = 5 = \frac{2\pi}{T_3}$ and $T_3 = \frac{2\pi}{5}$

Ratio of time periods,

$$\frac{T_1}{T_2} = \frac{\pi}{2\pi/3} = \frac{3}{2} = 1.5 = \text{Rational number}$$

$$\frac{T_1}{T_3} = \frac{\pi}{2\pi/5} = \frac{5}{2} = 2.5 = \text{Rational number}$$

$$\frac{T_2}{T_3} = \frac{2\pi/3}{2\pi/5} = \frac{5}{3} = 1.666 = \text{Rational number}$$

Since ratios of time periods of signals are rational numbers so given signal is periodic.

Fundamental period,

$$T_o = \frac{\text{L.C.M. of numerator of } T_1, T_2 \,\&\, T_3}{\text{H.C.F. of denominator of } T_1, T_2 \,\&\, T_3}$$

$$\Rightarrow \quad T_o = \frac{\text{L.C.M. of}(2\pi, 2\pi, 2\pi)}{\text{H.C.F. of}(1,3,5)} = \frac{2\pi}{1} = 2\pi$$

(ii) $x(t) = e^{j8\pi t} = e^{j\omega_o t}$

where, $\omega_o = \frac{2\pi}{T_o} = 8\pi$

$\Rightarrow \quad \boxed{T_o = \frac{1}{4}}$

So, signal is periodic.

(iii) $x(t) = e^{-7t} \sin 10\pi t$

Exponential decaying signals are non-periodic signals.

(iv) $x(t) = \cos 2t \cos 4t$

$$= \frac{1}{2}\left[\cos\left(\frac{2+4}{2}\right)t + \cos\left(\frac{4-2}{2}\right)t\right]$$

$$= \frac{1}{2}[\cos 3t + \cos t] = \frac{1}{2}\cos 3t + \frac{1}{2}\cos t = x_1(t) + x_2(t)$$

where, $x_1(t) = \frac{1}{2}\cos 3t = \frac{1}{2}\cos \omega_1 t$

$\Rightarrow \quad \omega_1 = \frac{2\pi}{T_1} = 3 \;\&\; T_1 = \frac{2\pi}{3}$

and $x_2(t) = \frac{1}{2}\cos t = \frac{1}{2}\cos \omega_2 t$

$\Rightarrow \quad \omega_2 = \frac{2\pi}{T_2} = 1 \;\&\; T_2 = 2\pi$

Ratio of time periods,

$$\frac{T_1}{T_2} = \frac{2\pi/3}{2\pi} = \frac{1}{3} = \text{Rational number}$$

Since ratio of time periods is rational number so signal is periodic. Fundamental period of x(t),

$$T_o = \frac{\text{L.C.M.of}(2\pi, 2\pi)}{\text{H.C.F.of}(1,3)} = \frac{2\pi}{1} = 2\pi$$

**2. *Ans.(a)***

**3. *Ans.(b)***

**4. *Ans. (b)***

**5. *Ans. (a)***

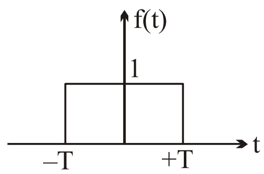
According to sampling property of impulse function,,

$$\int_{-\infty}^{\infty} x(t)\delta(t - t_o)dt = x(t_o)$$

if $x(t) = \cos\frac{3}{2}t$ and $t_o = 0$

then, $\int_{-\infty}^{\infty} \cos\left(\frac{3}{2}t\right)\delta(t)dt = \cos\frac{3}{2}(0) = 1$

**6. *Ans. (b)***



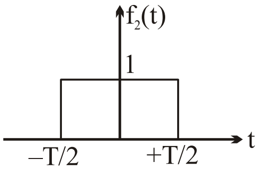

Let $f(t) = 1 \quad ; \quad -T < t < T$

$= 0 \quad ‘ \quad |t| > T$

Energy carried by f(t),

$$E_\infty = \int_{-\infty}^{\infty} [f(t)]^2 dt,$$

$$E_\infty = \int_{-T}^{+T} [1]^2 dt = 2T$$




Let $f_2(t) = f(2t)$

$\Rightarrow$ $f_2(t) = 1$ ; $-T/2 < t < T/2$

$$\therefore \quad E_2 = \int_{-\infty}^{\infty} [f_2(t)]^2 dt = \int_{-\infty}^{\infty} [f(2t)]^2 dt = \int_{-T/2}^{+T/2} (1)^2 dt = T$$

$$\Rightarrow \quad E_2 = \frac{E}{2}$$

**7.** ***Ans.(c)***

**8.** ***Ans.(b)***

**9.** ***Ans. (c)***

**10.** ***Ans.(b)***

**11.** ***Ans.(a)***

**12.** ***Ans. (d)***

**13.** ***Ans. (a)***

Given, $x[n] = [-4 - j5 \quad 1 \underset{\uparrow}{+} j2 \quad 4]$

$$\Rightarrow \quad x^*[-n] = [4 \quad 1 - \underset{\uparrow}{j2} \quad -4 + j5]$$

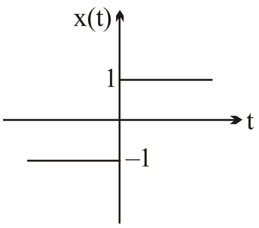
Conjugate antisymmetric part of x[n] is given by,

$$x_{CAS} = \frac{x[n] - x^*[-n]}{2}$$

$$x_{CAS} = \left[\frac{-4 - j5 - 4}{2} \quad \frac{1 + j2 - 1 + 2j}{2} \quad \frac{4 + 4 - j5}{2}\right]$$

$$= [-4 - j2.5 \quad \underset{\uparrow}{j2} \quad 4 - j2.5]$$

**14.** ***Ans. (a)***




$x(t) = u(t)$

$t > 0$

$= -u(-t)$

$t < 0$

$\therefore$ $x(t) = u(t) - u(-t)$

Even part of a signal f(t) is given by,

$$f_e(t) = \frac{1}{2}[f(t) + f(-t)]$$

for step function, $f(t) = u(t)$,

$$u_e(t) = \frac{1}{2}[u(t) + u(-t)] = \frac{1}{2}$$

Odd part of a signal f(t) is given by,

$$f_0(t) = \frac{1}{2}[f(t) - f(-t)]$$

for $f(t) = u(t)$

$$\Rightarrow \quad u_0(t) = \frac{1}{2}[u(t) - u(-t)] = \frac{1}{2}x(t)$$

**15.** ***Ans.(d)***

**16.** ***Ans.(a)***

**17.** ***Ans. (d)***

**18.** ***Ans. (d)***

**19.** ***Ans. (d)***

Dirac delta function is defined by,

$$\delta(t) = 0 \quad ; \; t \neq 0$$

and $\int_{-\infty}^{\infty} \delta(t) dt = 1$

**20.** ***Ans. (d)***

A bounded signal is always finite.

**21.** ***Ans.(b)***

**22.** ***Ans.(d)***

**23.** ***Ans. (a,d)***

**24.** ***Ans.(d)***

**25.** ***Ans.(b)***

**26.** ***Ans. (b)***

(i) A system is causal if its present output depends on present and/or past values of inputs. But time scaling gives non causal system.

(ii) A system is time invariant system if time shift in input gives identical shift in output. But time scaling results in a time varying system.

(iii) A system is unstable if bounded input gives unbounded output. So integrator is an example of unstable system.

(iv) The system is linear if a time shift input leads to identical shift in output.

Given, $y(t)\int_{-\infty}^{5t} x(\tau)d\tau,\ t > 0$

***Conclusion :***

A. Given system is a non-causal system as it has time scaling.

B. The given system is linear because it is an integrator which is an example of linear system.

C. The system is time varying because of time scaling.

D. The system output is unbounded for bounded value of x(t). So it is an example of unstable system.

**27.** ***Ans. (d)***

Given, $x(t) = 8\sin\left(0.8\pi t + \frac{\pi}{4}\right)$

$\Rightarrow \quad x(t) = 8\sin\left(\omega_o t + \frac{\pi}{4}\right)$

where, $\omega_o = 0.8\pi = \frac{2\pi}{T_o}$ = fundamental frequency of the signal.

and $T_o$ is fundamental period of x(t)

$\Rightarrow \quad T_o = \frac{2\pi}{0.8\pi} = 2.5\text{sec}$

***Note :*** A continuous time sinusiodal signal having single sine or consine term is always periodic in nature.

**28.** ***Ans.(b)***

**29.** ***Ans.(a)***

**30.** ***Ans.(d)***

**31.** ***Ans. (c)***

**32.** ***Ans.(c)***

**33.** ***Ans.(a)***

**34.** ***Ans.(c)***

**35.** ***Ans.(c)***

**36.** ***Ans. (b)***

**37.** ***Ans.(a)***

**38.** ***Ans. (d)***

**39.** ***Ans. (a)***

**40.** ***Ans.(a)***

**41.** ***Ans.(a)***

**42.** ***Ans.(d)***

**43.** ***Ans. (c)***

**44.** ***Ans. (a)***

**45.** ***Ans.(c)***

**46.** ***Ans. (d)***

$T_0 = \frac{2\pi}{\omega_0} = \frac{2\pi}{21}$

and $\frac{T_s}{T_0} = \frac{T_3}{(2\pi/21)} = \frac{m}{N_0}$

$\Rightarrow T_s = \frac{m}{N_0}\cdot\frac{2\pi}{21}$

$\Rightarrow 0.3\pi = \frac{m}{N_0}\cdot\frac{2\pi}{21}$

$\Rightarrow N_0 = \frac{20}{63}m$

for minimum, m = 63, then $N_0$ = 20 (fundamental period)

**47.** ***Ans. (d)***

**48.** ***Ans. (d)***

**49.** ***Ans.(b)***

**50.** ***Ans. (a)***

$y(n) = x\left(\frac{n}{2} - 1\right)$, n is even

= 0 ; for, ‘n’ is odd.

n = 0, y(n) = x(–1) = 1

n = 2, y(n) = x(0) = 2

n = 4, y(n) = x(1) = 1

n = 6, y(n) = x(2) = 1/2