POSTAL BOOK PACKAGE 2027

INSTRUMENTATION ENGINEERING

OBJECTIVE PRACTICE SETS VOLUME - IV

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CONTROL SYSTEMS AND PROCESS CONTROL

OBJECTIVE PRACTICE SETS

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Introduction

MCQ and NAT Questions

Q.1 A control system is represented by $y(t) = x(t + T)$ with $T > 0$. Is the system causal?
(a) Yes (b) No
(c) Not necessarily (d) None of these

Q.2 $s(t)$ is step response and $h(t)$ is impulse response of a system. Its response $y(t)$ for any input $u(t)$ is given by

(a) $\frac{d}{dt}\int_0^t s(t-\tau)\, u(\tau)\, d\tau$

(b) $\int_0^t s(t-\tau)\, u(\tau)\, d\tau$

(c) $\int_0^t \int_0^t s(t-\tau_1)\, u(\tau_1) d\tau_1\, d\tau$

(d) $\int_0^t h(t-\tau) u(\tau) d\tau$

Q.3 When a human being tries to approach an object, his brain acts as
(a) an error measuring device
(b) a controller
(c) an actuator
(d) an amplifier

Q.4 Which one of the following is an example of open loop system
(a) Washing machine
(b) Respiratory system of animal
(c) Stablisation of air pressure entering into mask
(d) Execution of program by computer

Q.5 Which is not an example of closed loop system?
(a) Radar tracking system
(b) Electric iron
(c) Missile launching system
(d) Traffic light controller

Q.6 Consider the following statements:
Statement 1: The difference between the output response and the reference signal is called actuating signal.
Statement 2: If the initial conditions for a system are inherently zero, it means system is at rest or no energy stored in any of its parts.
(a) Statement 1 is wrong, 2 is correct
(b) Statement 1 is correct, 2 is wrong
(c) Both the statement are correct
(d) Both the statements are wrong

Q.7 The Laplace transform at a transportation lag of 2 seconds is given as :

(a) $\frac{1}{s+2}$ (b) e^{2s}
(c) e^{-2s} (d) $e^{2/s}$

Q.8 A certain LTI system has input $r(t)$ and output $c(t)$. If the input is first passed through a block whose T.F. is e^{-s} and then applied to system. The modified output will be
(a) $c(t)\, u(t-1)$ (b) $c(t-1)\, u(t)$
(c) $c(t-1)\, u(t-1)$ (d) none of these

Q.9 Let $F(s)$ be the Laplace transform of a signal $f(t)$.

If $F(s) = \frac{K}{(s+1)(s^2+4)}$, then $\lim_{t\to\infty} f(t)$ is given by

(a) $K/4$ (b) zero
(c) infinite (d) undefined

Q.10 For the given transfer function what will be the initial value $F(s) = \frac{(2s+1)}{s(4s+3)}$?

(a) $\frac{1}{3}$ (b) $\frac{1}{2}$
(c) $\frac{2}{3}$ (d) 0

Q.11 The compensator $G(s) = \frac{16(1+30s)}{(1+5s)}$ would provide gain at high frequency,

(a) 24.08 dB (b) 55.45 dB
(c) 91.28 dB (d) 39.65 dB

Q.12 The final value of the function $F(s) = \frac{5}{s(s^2+s+2)}$ is equal to ________.

Q.13 The voltage across an element in a circuit is given by $V(s) = \frac{1}{s(s+\alpha)}$. If $v(\infty)$ is equal to 4 V then the value of $v(t)$ at t = 1 sec is ____________ V.

Q.14 Assertion (A): A linear system gives a bounded output if the input is bounded.

Reason (R): The roots of the characteristic equation have all negative real parts and response due to initial conditions decay to zero as time t tends to infinity.

(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

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Answers Introduction

1. (b) 2. (d) 3. (b) 4. (a) 5. (d) 6. (d) 7. (c) 8. (c) 9. (b)
10. (b) 11. (d) 12. (2.5) 13. (0.885) 14. (d)

Explanations Introduction

1. (b)

$$y(t) = x(t+T)$$

Taking Laplace transform,

$$Y(s) = X(s)e^{sT}$$

$$H(s) = \frac{Y(s)}{X(s)} = e^{sT}$$

Taking inverse Laplace transform

$$h(t) = \delta(t+T),\ T > 0$$

Thus, $h(t) \neq 0$, $t < 0$, its an impulse at $t = -T$.
System is causal if $h(t) = 0$, $t < 0$.

2. (d)

$$y(t) = x(t) \otimes h(t)$$

$$y(t) = u(t) \otimes h(t)$$

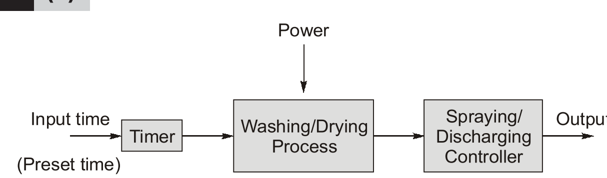
$$y(t) = \int_{-\infty}^{\infty} h(t-\tau)\,u(\tau)dt$$

$$y(t) = \int_{0}^{t} h(t-\tau)\,u(\tau)d\tau$$

3. (b)

When a human being tries to approach an object, his brain acts as a controller because his brain controls the activity of the human.

4. (a)

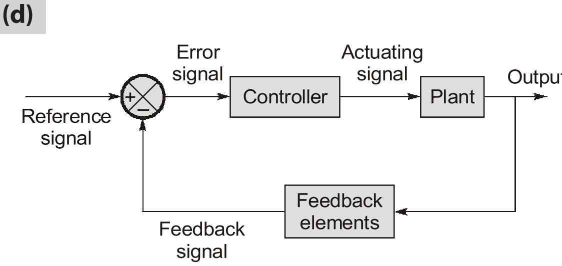


In the block diagram of a washing machine, input and output are unrelated, in the above. Thus washing machine is an example of open loop system.

5. (d)

Since all the system except (d) depend on the target or output.
Hence, output/target provides feedback to the system. While traffic light controller does not take any output consideration.

6. (d)



Error signal = Reference – Output

7. (c)

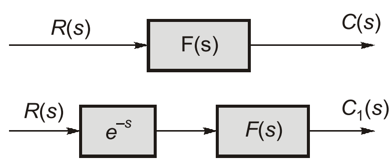
Transportation lag = e^{-st_d}

where t_d is time delay

Here, $t_d = 2$ sec

Thus, lag = e^{-2s}

8. (c)



$$C(s) = F(s)\,R(s)$$
$$C_1(s) = R(s)\cdot e^{-s}\cdot F(s)$$
$$C_1(s) = C(s)\,e^{-s}$$
$$\because \quad L^{-1}[F(s)\,e^{-as}] = f(t-a)\,u(t-a)$$
$$\therefore \quad c_1(t) = c(t-1)\,u(t-1)$$

9. (b)

$$F(s) = \frac{K}{(s+1)(s^2+4)}$$

We know by Final value theorem

$$\lim_{t\to\infty} f(t) = \lim_{s\to 0} sF(s)$$
$$= \lim_{s\to 0}\frac{sK}{(s+1)(s^2+4)} = 0$$

10. (b)

By initial value theorem $\lim\limits_{t\to 0} f(t) = \lim\limits_{s\to\infty} sF(s)$

where $F(s)$ is Laplace transform of $f(t)$.

So, Initial value $= \lim\limits_{s\to\infty}\dfrac{s(2s+1)}{s(4s+3)}$

$$= \lim_{s\to\infty}\frac{2\left(1+\frac{1}{s}\right)}{4\left(1+\frac{3}{4s}\right)} = \frac{2}{4}\frac{(1+0)}{(1+0)}$$
$$= \frac{1}{2}$$

11. (d)

Sinusoidal transfer function is given by

$$G(j\omega) = \frac{16(1+j30\omega)}{(1+j5\omega)}$$

Solving, we get

$$G(j\omega) = \frac{16\times j\omega\left(\frac{1}{j\omega}+30\right)}{j\omega\left(\frac{1}{j\omega}+5\right)}$$

At $\omega\to\infty$ (high frequency)

$$G(j\omega)_{\omega\to\infty} = \frac{16\times\left(\frac{1}{\infty}+30\right)}{\left(\frac{1}{\infty}+5\right)} = 96$$

Gain in dB = 20 log 96

gain = 39.65 dB

12. (2.5)

$$F(s) = \frac{5}{s(s^2+s+2)}$$

Final value $= \lim\limits_{s\to 0} s\,F(s)$

$$= \lim_{s\to 0}\frac{5s}{s(s^2+s+2)} = \frac{5}{2}$$

13. (0.885)

$$V(s) = \frac{1}{s(s+\alpha)}$$

By $v(\infty) = \lim\limits_{t\to\infty} v(t) = \lim\limits_{s\to 0} sV(s)$

By final value theorem

$$v(\infty) = \frac{1}{\alpha} = 4$$
$$\alpha = \frac{1}{4}$$

Now, $V(s) = \dfrac{1}{s(s+\alpha)}$

By partial fraction

$$V(s) = \frac{1}{\alpha}\left[\frac{1}{s}-\frac{1}{s+\alpha}\right]$$
$$V(s) = 4\left[\frac{1}{s}-\frac{1}{s+\alpha}\right]$$

By inverse Laplace transform

$$v(t) = 4[1-e^{-\alpha t}] = 4[1-e^{-t/4}]$$
$$v(t = 1\text{ sec}) = 4[1-e^{-1/4}]$$
$$= 0.885\text{ V}$$

14. (d)

Assertion is wrong as it is applicable only for the BIBO (Bounded Input Bounded Output) stable system.

Moreover if the system is unbounded then assertion will be wrong.

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SIGNALS AND SYSTEMS

OBJECTIVE PRACTICE SETS

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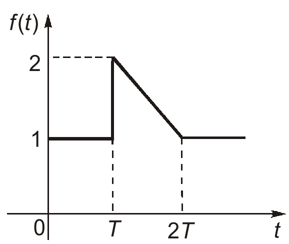
1 CHAPTER Basics of Signals and Systems

MCQ and NAT Questions

Q.1 If a continuous time signal $x(t)$ can take on any value in the continuous interval $(-\infty, \infty)$, it is called
(a) Deterministic signal
(b) Random signal
(c) Analog signal
(d) Digital signal

Q.2 The function $f(t)$ shown in the figure can be represented as



(a) $u(t)+u(t-T)-\frac{(t-T)}{T}u(t-T)+\frac{(t-2T)}{T}u(t-2T)$

(b) $u(t)-u(t-T)+\frac{(t-T)}{T}u(t-T)-\frac{(t-2T)}{T}u(t-2T)$

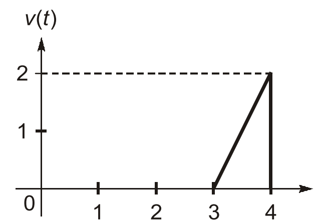
(c) $u(t)-u(t-T)-\frac{(t-T)}{T}u(t-T)-\frac{2(t-2T)}{T}u(t-2T)$

(d) $u(t)+u(t-T)+\frac{(t-T)}{T}u(t-T)-\frac{2(t-2T)}{T}u(t-2T)$

Q.3 Which of the following statements is/are true?
1. If $x(t)$ is a continuous time periodic signal with period T, then $y(t) = x(2t)$ will also be periodic with period $2T$.
2. Sum of two continuous time periodic signals may or may not be periodic.
3. Sum of two discrete time periodic signals may or may not be periodic.

(a) 2 and 3 only
(b) 1 and 3 only
(c) 1 and 2 only
(d) 2 only

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

Q.5 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

Q.6 Which one of the following relation is not correct?
(a) $f(t)\delta(t) = f(0)\delta(t)$
(b) $\int_{-\infty}^{\infty} f(t)\delta(t-\tau)dt = f(\tau)$
(c) $f(t) * \delta(t-\tau) = f(t-\tau)$
(d) $\int_{-\infty}^{\infty} \delta(at)dt = 1$

Q.7 Which of the following signals are periodic?
1. $\cos\left(\frac{\pi}{3}n\right)+\sin\left(\frac{\pi}{3}n\right)$

2. $\cos\left(\frac{1}{2}n\right) + \cos\left(\frac{1}{3}n\right)$
3. Even $\{\cos(4\pi t)u(t)\}$
4. Even $\{\sin(4\pi t)u(t)\}$

(a) 1 and 4 only (b) 1, 2 and 3 only
(c) 1 and 3 only (d) 1, 3 and 4 only

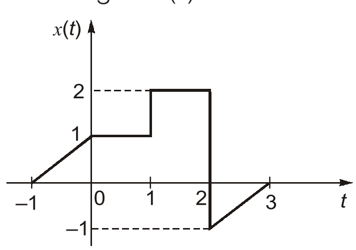
Q.8 The power in the signal

$$s(t) = 8\cos\left(20\pi t - \frac{\pi}{2}\right) + 4\sin(15\pi t) \text{ is}$$

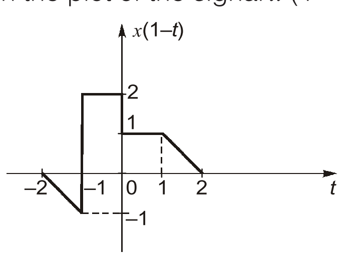
(a) 40 (b) 41
(c) 42 (d) 82

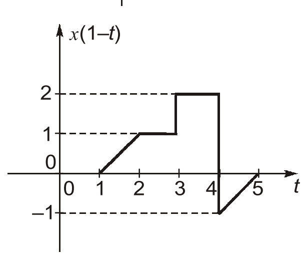
Q.9 **Statement (I):** The total energy of an energy signal falls between the limits 0 and ∞.
Statement (II): The average power of an energy signal is zero.
(a) Both Statement (I) and Statement (II) are individually true and Statement (II) is the correct explanation of Statement (I)
(b) Both Statement (I) and Statement (II) are individually true but Statement (II) is **NOT** the correct explanation of Statement (I)
(c) Statement (I) is true but Statement (II) is false
(d) Statement (I) is false but Statement (II) is true

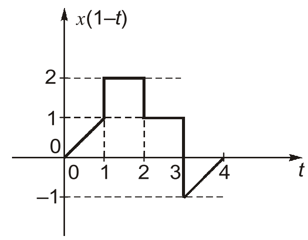
Q.10 If a plot of a signal $x(t)$ is as shown in the Figure.

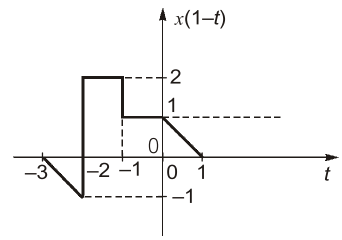


Then the plot of the signal $x(1 - t)$ will be:

(a)


(b)


(c)


(d)


Q.11 The signal $x(t) = A\cos(\omega_0 t + \phi)$ 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

Q.12 Double integration of a unit step function would lead to
(a) an impulse (b) a parabola
(c) a ramp (d) a doublet

Q.13 If $\int_{-\infty}^{\infty} e^{3\left(\frac{t}{2}-1\right)} . \sin\frac{\pi t}{8\beta} . \delta(2-t) = \frac{-1}{\sqrt{2}}$.

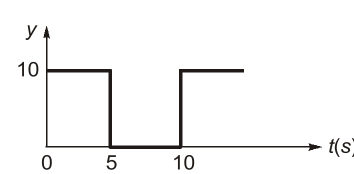
Then the maximum value of β is

(a) -1 (b) $\frac{1}{5}$

(c) $\frac{1}{13}$ (d) $\frac{1}{21}$

Q.14 For a periodic waveform to be halfwave symmetric, it must be represented by a function satisfying
(a) $f(t) = f(t + T/2)$ (b) $f(t) = -f(t + T/2)$
(c) $f(t) = f - (-t)$ (d) $f(t) = f(-t)$

Q.15 In the given figure, the effective value of the waveform is



(a) 5.0 (b) 2.5
(c) $\sqrt{2.5}$ (d) $\sqrt{50}$

Q.16 Consider the sequence

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

The conjugate anti-symmetric part of the sequence is

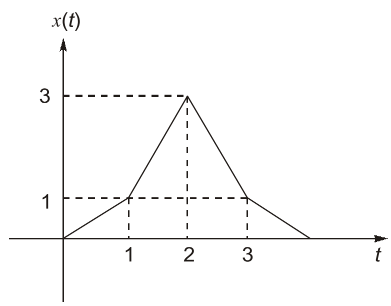
(a) $[-4 - j2.5 \quad j2 \quad 4 - j2.5]$

(b) $[-j2.5 \quad 1 \quad j2.5]$

(c) $[-j5 \quad j2 \quad 0]$

(d) $[-4 \quad 1 \quad 4]$

Q.17 If $y(t) = \int_{-\infty}^{\infty} x(t).\delta'(t-2.5)dt$. Then value of $y(t)$ is



(a) 2 (b) –2

(c) –3 (d) dependent on 't'

Q.18 $x[n]$ is defined as

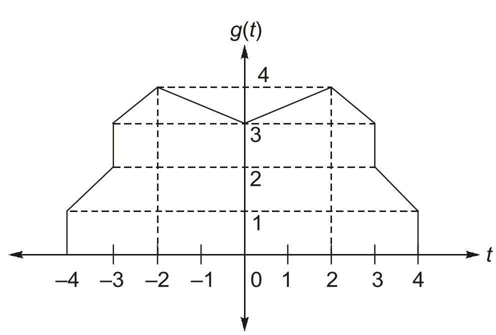
$$x[n] = \begin{cases} 0 & \text{for } n < -2 \text{ and } n > 4 \\ 1, & \text{otherwise} \end{cases}$$

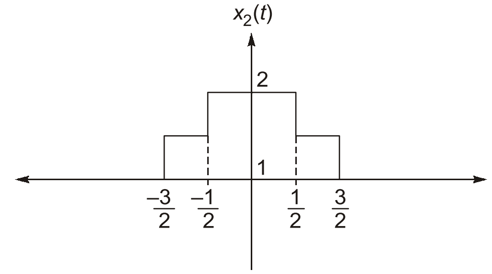
Determine the value of n for which $x[-n-2]$ is guaranteed to be zero.

(a) $n < 1$ and $n > 7$ (b) $n < -4$ and $n > 2$

(c) $n < -6$ and $n > 0$ (d) $n < -2$ and $n > 4$

Q.19 The response of an LTI system for input $x_1(t) = u(t+1) - u(t-1)$ is given as $g(t)$. If the input to the same system is $x_2(t)$ as shown below, and response being $y(t)$, then $y(0) =$ ________.





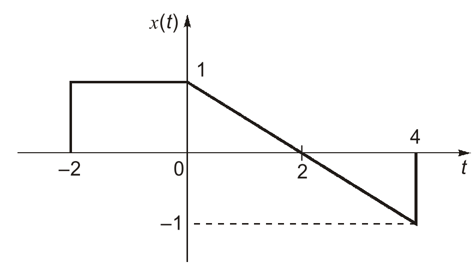
(a) 6.5 (b) 2

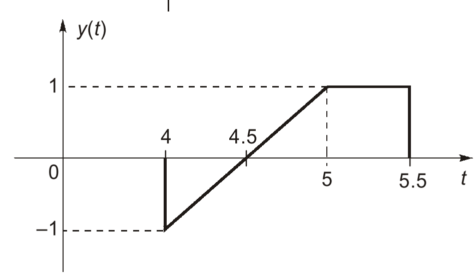
(c) 3 (d) 4

Q.20 The value of $\int_{-2}^{2} (t-3)\delta(2t+2)dt$ will be _____.

Q.21 A time domain energy signal is defined as $x(t)$ with energy equal to 10 J, then the energy of the signal $2x(5t-6)$ is equal to __________ J.

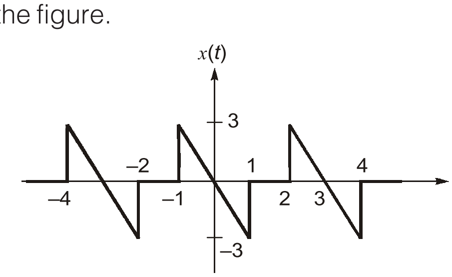
Q.22 A signal $x(t)$ and its transformed signal $y(t)$ are shown in figure below:





If $y(t) = x(-at + 20)$, then the value of 'a' is _____.

Q.23 The waveform of a periodic signal $x(t)$ is shown in the figure.



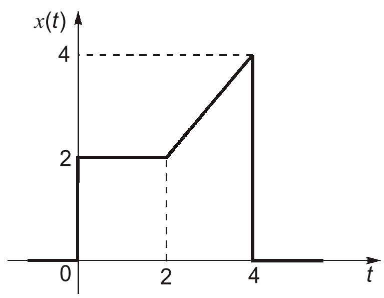
A signal $g(t)$ is defined by $g(t) = x\left(\frac{t-1}{2}\right)$. The average power of $g(t)$ is __________.

Q.24 For a power signal $f(n) = Au(n)$. The average power is given by 8 W, then the magnitude of A will be ______.

Q.25 The period of the signal

$$x[n] = \cos\frac{\pi}{4}n + \sin\left(\frac{\pi}{3}n + \frac{1}{2}\right) \text{ is } \_\_\_\_\_\_\_\_.$$

Q.26 Consider the following signal:

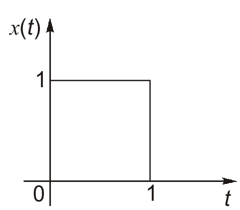


The signal $x(t)$ is expressed as,

$x(t) = 2u(t) + (t-2)\,u(t-2) - (t-t_0)\,u(t-4)$

If $u(t)$ is a unit step function, then the value of t_0 will be ________.

Q.27 An LTI system has step response $(1 - e^{-t})\,u(t)$. The response of the system for following input $x(t)$ at $t = 2$ is______.



Multiple Select Questions (MSQs)

Q.28 For which of the following function(s) the time scaling operation will effect its original nature of the function:

(a) $\delta(t)$

(b) $u(t)$

(c) $r(t)$

(d) A rectangular pulse within finite duration.

Q.29 A discrete system with input $x[n]$ and output $y[n]$ are related by

$$y[n] = \sum_{n=-\infty}^{\infty} x[n]e^{-j\omega n}$$

The system is

(a) unstable (b) stable

(c) time variant (d) time invariant

Q.30 Consider a continuous time signal

$x(t) = 2\cos\left(\frac{\pi t}{4}\right) * \delta\left(\frac{t}{2} - 1\right)$. Then for which value of 't', signal $x(t)$ is zero.

(a) $t = 0$ (b) $t = 2$

(c) $t = 1$ (d) $t = 4$

Q.31 Consider a discrete-time periodic signal $x[n] = \begin{cases} 1, & 0 \le n \le 7 \\ 0, & 8 \le n \le 9 \end{cases}$ with period of $N = 10$. A function $y[n]$ is defined as $y[n] = \xi[n] - \xi[n-1]$, then the correct options regarding $y[n]$ are

(a) period $N = 10$

(b) period $N = 8$

(c) $y[n] = \{1,0,0,0,0,0,0,0,-1,0\}$ for one time period

(d) $y[n] = \{1,0,0,0,0,0,0,-1,0\}$ for one time period

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Answers Basics of Signals and Systems

1.	(c)	2.	(a)	3.	(d)	4.	(d)	5.	(a)	6.	(d)	7.	(c)
8.	(a)	9.	(b)	10.	(a)	11.	(b)	12.	(b)	13.	(b)	14.	(b)
15.	(d)	16.	(a)	17.	(a)	18.	(c)	19.	(a)	20.	(–2)	21.	(8)
22.	(4)	23.	(2)	24.	(4)	25.	(24)	26.	(0)	27.	(0.232)	28.	(a, c, d)
29.	(b, c)	30.	(a, d)	31.	(a, c)								

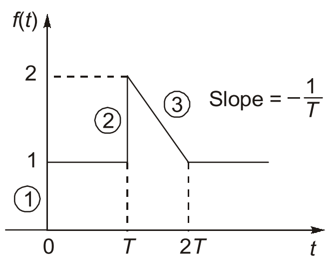
Explanations **Basics of Signals and Systems**

1. (c)

If a continuous time signal can take on any value in the continuous interval $(-\infty, \infty)$ then this signal is known as analog signal.

2. (a)

For the given $f(t)$



Step (1) = $u(t)$ = $u(t)$ both steps are of unity magnitude

Step (2) = $u(t-T) = u(t-T)$

Hence ramp (3) = $\frac{-1}{T}\{r(t-T)-r(t-2T)\}$

$$= \frac{-1}{T}\{(t-T)u(t-T)-(t-2T)u(t-2T)\}$$

Since, $r(t) = tu(t)$

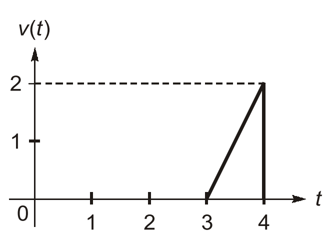
Hence,

$$f(t) = u(t)+u(t-T)-\frac{(t-T)}{T}u(t-T)+\frac{(t-2T)}{T}u(t-2T)$$

3. (d)

- If $x(t)$ is periodic with time period T, then $y(t) = x(2t)$ will be periodic with time period $T/2$.
- Sum of two discrete time periodic signals is always periodic.

4. (d)



v(t) consist 1 Ramp and 1 negative step,

Hence Ramp (1) having slope = 2

So Ramp (1) = $2\{r(t-3)-r(t-4)\}$

step (2) = $-2u(t-4)$

So, $v(t) = 2r(t-3) - 2r(t-4) - 2u(t-4)$

$= 2(t-3)\,u(t-3) - 2(t-4)u(t-4) - 2u(t-4)$

$= 2(t-3)\,u(t-3) - 2(t-3)u(t-4)$

$= (2t-6)\,\{u(t-3) - u(t-4)\}$

5. (a)

- Even signal $x(n) = x(-n)$
- Causal system is one in which output at any time depends only on present and/or past values of input.
- Periodic signal is one which satisfies
  $x(n) = x(n+N)$;
  $N \rightarrow$ Fundamental period.
- Energy signal is absolutely summable i.e. $x(n)$

$$= \left|\left(\frac{1}{4}\right)^n u(n)\right| < \infty$$

6. (d)

$$\int_{-\infty}^{\infty} \delta(at)\,dt = \frac{1}{a}$$

Since, $\delta(at) = \frac{1}{|a|}\delta(t)$

7. (c)

1. $\cos\left(\frac{\pi}{3}n\right)+\sin\left(\frac{\pi}{3}n\right) \Rightarrow$ periodic

   Period $= \frac{2\pi\times 3}{\pi} = 6$

2. $\cos\left(\frac{1}{2}n\right)+\cos\left(\frac{1}{3}n\right) \Rightarrow$ non-periodic

3. Even $\{\cos(4\pi t)u(t)\}$

   $= \frac{\cos(4\pi t)\,u(t)+\cos(-4\pi t)u(-t)}{2}$

   $= \frac{\cos 4\pi t}{2} \Rightarrow$ Periodic

4. Even $\{\sin(4\pi t)u(t)\}$

   $= \frac{\sin(4\pi t)u(t)+\sin(-4\pi t)u(-t)}{2} \Rightarrow$ non-periodic

8. (a)

Given: $s(t) = 8\cos\left(20\pi t-\frac{\pi}{2}\right)+4\sin(15\pi t)$

$s(t) = 8\sin 20\pi t + 4\sin 15\pi t$

When both the sinusoidal signal having different frequency. Then overall power $(P) = P_1 + P_2$

$$P = \frac{8^2}{2}+\frac{4^2}{2} = 40$$

9. (b)

Energy of any signal is given by

$$E = \int_{-\infty}^{\infty} |x^2(t)| dt$$

and power of a signal is given by

$$P = \lim_{T\to\infty} \int_{-T/2}^{T/2} \frac{1}{T}|x^2(t)dt|$$

For energy signal, Energy is finite

$$\therefore \quad P = \lim_{T\to\infty} \frac{E}{T}$$

$$P = \frac{E}{\infty} = 0$$

$\rightarrow$ All the finite duration and bounded signals are energy signals.

Hence statements (I) and (II) are correct but statement (II) is not correct explanation of statement (I).

10. (a)

For given question $x(t)$ is defined for $-1 < t < 3$

Left shifted of $x(t)$ by 1: $-2 < t + 1 < 2$

Time reversal, $-2 < -t + 1 < 2$

Sorange of $x(1 - t)$ will be -2 to 2 by checking options.

11. (b)

$$x(t) = A\cos(\omega_0 t + q)$$

this is periodic signal and according to definition, all periodic signals are power signal.

Here, $\quad \text{Power} = \left(\frac{A}{\sqrt{2}}\right)^2 = \frac{A^2}{2}$

12. (b)

$$\int_t u(\tau)d\tau = r(t) \quad \text{Ramp}$$

$$\int_t r(\tau)\, d\tau = p(t) \quad \text{Parabola}$$

13. (b)

$$\delta(2-t) = \delta(t-2)$$

$$f(t) = e^{3\left(\frac{2}{2}-1\right)}.\sin\frac{\pi(2)}{8\beta}$$

$$= e^{3(1-1)}\sin\frac{\pi}{4\beta} = \frac{-1}{\sqrt{2}}$$

$$\sin\frac{\pi}{4\beta} = \frac{-1}{\sqrt{2}}$$

$$\beta = \frac{1}{5}, \frac{1}{13} \quad \text{and } \beta = -1$$

$$\beta_{max} = \frac{1}{5}$$

14. (b)

For half wave symmetry

$$f(t) = -f\left(t+\frac{T}{2}\right) = -f\left(t-\frac{T}{2}\right)$$

15. (d)

Effective value = rms value

$$\text{Here} = \sqrt{\frac{1}{10}\int_0^5 (10)^2\, dt} = \sqrt{50}$$

16. (a)

Given, $\quad x[n] = [-4 \;\; -5j \;\; \underset{\uparrow}{1+2j} \;\; 4]$

$$x^*[n] = [-4+5j \;\; \underset{\uparrow}{1-2j} \;\; 4]$$

$$x^*[-n] = [4 \;\; 1-2j \;\; -4+5j]$$

Now, $\quad x_{oc} = \dfrac{x(n) - x^*(-n)}{2}$

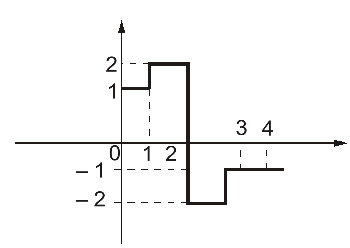
$$x_{oc} = \left[\frac{-4-5j-4}{2} \;\; \frac{(1+2j)-(1-2j)}{2}, \;\; \frac{4-(-4+5j)}{2}\right]$$

$$x_{oc} = [-4-2.5j \;\; \underset{\uparrow}{2j} \;\; 4-2.5j]$$

17. (a)

$$y(t) = \int_{-\infty}^{\infty} x(t).\delta'(t-2.5)dt$$

$$= -\left.\frac{dx(t)}{dt}\right|_{t=2.5}$$



$$y(t) = -(-2) = 2$$