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Question Paper Code	14008
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B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2025
 Third Semester
Electronics and Communication Engineering
 (Common to Computer and Communication Engineering)
24ECPC301 - SIGNALS AND SYSTEMS
 Regulations - 2024

Duration: 3 Hours

Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

Marks K-
Level CO

- | | | | | |
|-----|---|---|----|-----|
| 1. | Select the type of the system $x(-n)$:
a) Time invariant b) Time Variant c) Static d) Both b and c | 1 | K1 | CO1 |
| 2. | Infer the period of the signal $y(t) = \cos 5\pi t$ is
a) 0.2 b) 0.3 c) 0.4 d) $2/3\pi$ | 1 | K2 | CO1 |
| 3. | Tell the Fourier transform of $\frac{dx(t)}{dt}$ will be
a) $\frac{dX(j\omega)}{dt}$ b) $j2\pi \frac{dX(j\omega)}{dt}$ c) $j\omega \frac{dX(j\omega)}{dt}$ d) $\frac{X(j\omega)}{j\omega}$ | 1 | K1 | CO2 |
| 4. | Find the initial value of $X(S) = \frac{1}{s+3}$
a) 0 b) 1 c) 2 d) 1/3 | 1 | K1 | CO2 |
| 5. | Choose the formula for the transfer function:
a) $Y(S)/X(S)$ b) $Y(S).X(S)$ c) $X(S)/Y(S)$ d) $x(t)/y(t)$ | 1 | K1 | CO3 |
| 6. | Interpret the poles and zeros of $H(s) = \frac{s(s+3)}{(s+2)(s+4)(s+5)}$
a) -2,-4,-5 and 0,-3 b) 0,-3 and -2,-4,-5 c) 0,3 and 2,4,5 d) 2,4,5 and 0,3 | 1 | K2 | CO3 |
| 7. | Find the ROC of a finite duration signal:
a) Entire Z plane b) Unit circle
c) depends on the value of pole d) Exterior to unit circle | 1 | K1 | CO4 |
| 8. | Show the Z transform of impulse function :
a) 1 b) 0 c) 2 d) none of these | 1 | K2 | CO4 |
| 9. | What is the impulse response if $H(z) = 2 + z^{-2} + 4z^{-4}$
a) {2,1,4} b) {2,0,1,4} c) {2,0,1,0,4} d) {2,0,0,1,4} | 1 | K1 | CO5 |
| 10. | Which representation requires less number of delay elements
a) Direct form I b) Direct form II c) Both d) None | 1 | K1 | CO6 |

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

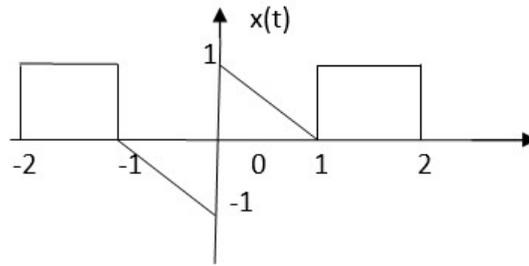
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|-----|--|---|----|-----|
| 11. | Illustrate $2\delta(n-6) + 2\delta(n-2) - 4\delta(n+5) + \delta(n)$. | 2 | K2 | CO1 |
| 12. | Interpret the even and odd components of $\sin(t)$. | 2 | K2 | CO1 |
| 13. | Recall Parseval's theorem in Fourier Transform. | 2 | K1 | CO2 |
| 14. | Find the inverse Laplace transform : $\frac{1}{s+3}$ | 2 | K1 | CO2 |
| 15. | Infer the frequency response of an LTI system described by $\frac{d^2y(t)}{dt^2} + 6\frac{dy(t)}{dt} + 8y(t) = 3x(t)$ using Fourier transform. | 2 | K2 | CO3 |

16. Show the differential equation relating the input and output of a continuous time system represented by $H(S) = \frac{4}{S^2 + 8S + 4}$ 2 K2 CO3
17. Consider the signal $x(t) = 2\sin 20\pi t + \cos 100\pi t + 4\sin 500\pi t$. Can we reconstruct the signal without aliasing, if the sampling frequency=200Hz. If not, find the sampling frequency inorder to reconstruct the signal without aliasing. 2 K2 CO4
18. Find the Z transform and ROC of the sequence $x(n) = \{2, -1, 3, 2, 0, 1\}$. 2 K2 CO4
19. Find the output of the system whose input and transfer function are $x(n)=\{1, 2, 3, 4\}$ with $h(n)=\{2, -1, 3, -2\}$ respectively. 2 K2 CO5
20. Interpret the difference equation relating the input and output of the system represented by $H(z) = \frac{1+0.8z^{-1}}{1-0.25z^{-2}+0.5z^{-1}}$ 2 K2 CO5
21. List the advantages of Direct form – II realization structure. 2 K1 CO6
22. Draw the direct form I realization structure of system described by the difference equation $y(n)=x(n)-0.8y(n-1)$. 2 K2 CO6

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23. a) Construct $x(-t+1)$, $x(2t)$, $x(3-t)$, $x(3t+1)$ for the signal: 11 K3 CO1



OR

- b) Identify whether the following systems are memory less, causal, linear, time invariant or not. 11 K3 CO1
- i) $y(t) = \int_{-\infty}^{t/2} x(\tau) d\tau$
- ii) $y[n] = \log_{10}(|x[n]|)$
24. a) Apply the Fourier transform of the following signals 11 K3 CO2
- i) $x(t) = e^{-3t} [u(t+2) - u(t-3)]$
- ii) $x(t) = \sin \omega_0 t$

OR

- b) Make use of the Laplace transform $X(s)$ and sketch the pole-zero plot with the ROC for the following signals $x(t)$: 11 K3 CO2
- i) $x(t) = e^{-2t}u(t) + e^{-3t}u(t)$
- ii) $x(t) = e^{-3t}u(t) + e^{2t}u(-t)$
25. a) The input and the output of a casual LTI system are related by the differential equation $\frac{d^2 y(t)}{dt^2} + 6\frac{dy(t)}{dt} + 8y(t) = 2x(t)$. Analyze the system using CTFT and solve for the impulse response of the system and the output response of this system if $x(t) = t e^{-2t}u(t)$ 11 K4 CO3

OR

b)

11 K4 CO3

A system is described by the following differential equation $\frac{d^2 y(t)}{dt^2} + 7 \frac{dy(t)}{dt} + 12y(t) = x(t)$. Analyze and identify the output response of the system to a unit step input applied at $t=0$. The initial conditions are $y(0^-) = -2, \frac{dy(0^-)}{dt} = 0$

26. a)

Utilize the method of partial fraction to obtain the time domain signals corresponding to the following Z-transform $X(z) = \frac{1+\frac{7}{6}z^{-1}}{(1-\frac{1}{2}z^{-1})(1+\frac{1}{3}z^{-1})}$, if the ROC $|z| > \frac{1}{2}, |z| < \frac{1}{3}, \frac{1}{3} < |z| < \frac{1}{2}$.

11 K3 CO4

OR

b)

Build the DTFT of the following signals

11 K3 CO4

i) $x(n) = a^{|n|}$

ii) $x(n) = \sin\left(\frac{n\pi}{2}\right)u(n)$

27. a)

A system is described by the following difference equation $y(n) - \frac{3}{4}y(n-1) + \frac{1}{8}y(n-2) = x(n)$. Analyze the system to find the forced response of the system for an input $x(n) = 2^n u(n)$.

11 K4 CO5

OR

b)

Consider a causal and stable LTI system whose input $x(n)$ and output $y(n)$ are related through the second order difference equation $y(n) - \frac{1}{6}y(n-1) - \frac{1}{6}y(n-2) = x(n)$. Analyze the system to solve for the frequency response $H(e^{j\omega})$ and step response of the system.

11 K4 CO5

28. a)

A system is described by its system function $H(z) = \frac{2(z+2)}{z(z-1)(z+0.5)(z+0.4)}$. Realize the system using direct form I and parallel form structure.

11 K4 CO6

OR

b)

A system is described by its system function $H(s) = \frac{s^2+4s+3}{s^2+2s+5}$. Realize the system using direct form II and cascade form structure.

11 K4 CO6