

PART – C (5 × 12 = 60 Marks)
Answer ALL Questions

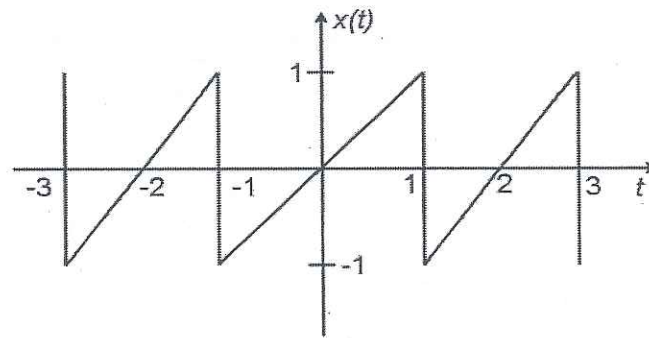
28. a. Given $x(n) = \{1, 1, 2, 3, 4, 0.5\}$ sketch the following signals.

- (i) $x(n-3)$ (ii) $x(n+2)$ (iii) $x(-n)$ (iv) $x(2-n)$ (v) $x(3n)$ (vi) $x\left(\frac{n}{2}\right)$

(OR)

b. Explain the classification of system with an example.

29. a. Find the trigonometric Fourier series for the periodic signal $x(t)$ shown in below.



(OR)

b. Find the Fourier transform of the following signal and sketch the magnitude and phase spectrum.

$$x(t) = e^{-at}U(t).$$

30. a. Compute the convolution for the given signals using Fourier transform.

$$x(t) = e^{-2t}U(t); h(t) = e^{-4t}U(t).$$

(OR)

b. Find the impulse and step response of the following system.

$$H(S) = \frac{S+2}{S^2+5S+4}$$

31. a. Find the Z transform of the signal $x(n) = \sin \omega_n U(n)$ and find ROC.

(OR)

b. Find IDFT of the following sequence $X(K) = \{1, 0, 1, 0\}$.

32. a. A causal system is represented by the following difference equation

$$y(n) + \frac{1}{4}y(n-1) = x(n) + \frac{1}{2}x(n-1)$$

- (i) Find the system function $H(z)$
(ii) Find the impulse response of the system.

(OR)

b. Determine the convolution sum of two sequences

$$x(n) = \{1, 4, 3, 2\}, h(n) = \{1, 3, 2, 1\}$$

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Reg. No.

B.Tech. DEGREE EXAMINATION, DECEMBER 2017
Third Semester

EI1006 – SIGNALS AND SYSTEMS

(For the candidates admitted during the academic year 2013 – 2014 and 2014 – 2015)

Note:

- (i) **Part - A** should be answered in OMR sheet within first 45 minutes and OMR sheet should be handed over to hall invigilator at the end of 45th minute.
(ii) **Part - B** and **Part - C** should be answered in answer booklet.

Time: Three Hours

Max. Marks: 100

PART – A (20 × 1 = 20 Marks)
Answer ALL Questions

- The value of $\delta(n)$ at $n = 0$ is
(A) 0 (B) 1
(C) -1 (D) $\frac{1}{2}$
- Fundamental period of $\cos 2t$ is
(A) 2π (B) 0
(C) π (D) 2
- $U(t) - U(t-1) =$
(A) 1 for $0 \leq t \leq 1$ (B) 1 for $t \geq 0$
(C) 0 for $0 \leq t \leq 1$ (D) 0 for $t < 1$
- The scaled impulse $\delta(2n) =$
(A) $2\delta(n)$ (B) $\frac{1}{2}\delta(n)$
(C) $\delta(n+1)$ (D) $\delta(n)$
- The Fourier series of a half wave symmetric periodic signal contains _____ Harmonics.
(A) Even (B) Odd
(C) Zero (D) Two
- The Fourier transform of a DC signal is
(A) 0 (B) 1
(C) π (D) $2\pi\delta(\Omega)$
- Laplace transform of $\delta(t)$ is
(A) 0 (B) 1
(C) ∞ (D) -1
- For a causal signal $x(t)$, the ROC of $X(s)$ is
(A) Right half of S plane (B) Left half of S plane
(C) Entire S plane (D) $j\Omega$ axis

9. Laplace transform of $\frac{d^2\delta(t)}{dt^2}$ is
 (A) 1 (B) S
 (C) S^2 (D) S^3
10. The transfer function of zero order hold is
 (A) $\frac{e^{-ST}}{S}$ (B) $\frac{1-e^{-ST}}{S}$
 (C) $\frac{1}{S}$ (D) $\frac{1-e^{-ST}}{S}$
11. Z transform of U(n) is
 (A) 1 (B) $\frac{1}{Z}$
 (C) $\frac{Z}{Z-1}$ (D) 0
12. The DFT of the sequence $x(n) = u(n)$ is
 (A) $\frac{1}{1-e^{-j\omega}}$ (B) $\frac{1}{e^{j\omega}}$
 (C) $e^{j\omega}$ (D) 1
13. The condition for the existence of DTFT for an aperiodic sequence is
 (A) $\sum_{n=-\infty}^{\infty} |x(n)| < \infty$ (B) $\sum_{n=-\infty}^{\infty} |x(n)| = 0$
 (C) $\sum_{n=-\infty}^{\infty} |x(n)| \leq \infty$ (D) $x(n) = 1$
14. The output of a system to a step input is $t^2 e^{-2t}$. The system function H(S) is
 (A) $\frac{2}{S+2}$ (B) $\frac{2}{(S+2)^2}$
 (C) $\frac{2}{(S+2)^3}$ (D) $\frac{2S}{(S+2)^3}$
15. ROC of a finite duration causal sequence is
 (A) Entire Z plane except at $Z = 0$ (B) Entire Z plane
 (C) Entire Z plane except at $Z = \infty$ (D) Entire Z plane except $Z = 0$ & ∞
16. The direct evaluation of DFT requires _____ complex multiplications
 (A) $N(N-1)$ (B) N^2
 (C) $N(N+1)$ (D) $\frac{N(N-1)}{2}$
17. If the output of discrete time LTI system is always identical to the input, then the impulse response h(n) is
 (A) Unit step (B) Unit impulse
 (C) All ones (D) Ramp

18. The Z transform of a system is $H(Z) = \frac{Z}{Z-0.2}$. If the ROC is $|Z| < 0.2$, then the impulse response of the system is
 (A) $(0.2)^n u(n)$ (B) $(0.2)^n u(-n-1)$
 (C) $-(0.2)^n u(n)$ (D) $-(0.2)^n u(-n-1)$

19. Z transform of $\delta(n)$ is
 (A) 0 (B) 1
 (C) ∞ (D) $\frac{1}{2}$
20. The condition for a LTI system to be stable is
 (A) $\sum_{n=0}^{\infty} h(n) = \infty$ (B) $\sum_{n=0}^{\infty} h(n) \leq \infty$
 (C) $\sum_{n=0}^{\infty} h(n) < \infty$ (D) $\sum_{n=0}^{\infty} h(n) = 0$

PART - B (5 × 4 = 20 Marks)
 Answer ANY FIVE Questions

21. Find the fundamental period of $e^{j\left(\frac{2\pi}{3}\right)n} + e^{j\left(\frac{3\pi}{4}\right)n}$
22. Determine the energy and power for $x(n) = u(n)$.
23. Explain the properties of Fourier transform.
24. Use Fourier transform to find the convolution of the signals $x_1(t) = e^{-at}U(t)$ and $x_2(t) = e^{-bt}U(t)$.
25. Find the circular convolution of two sequences given below $x_1(n) = \{1, 2, 3, 4\}$; $x_2(n) = \{1, -1, 2, 1\}$.
26. State and prove linearity and shifting property of Z transform.
27. Obtain the direct form II realization for the system described by the difference equation $y(n) - \frac{5}{6}y(n-1) + \frac{1}{6}y(n-2) = x(n) + 2x(n-1)$.