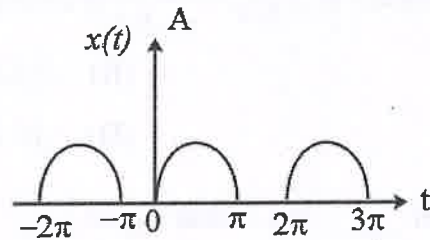


29. a. Find cosine Fourier series of the half wave rectified sine function



(OR)

b. Find the Laplace transform of the signal and find ROC, what are poles and zero locations.

(i) $x(t) = e^{-3t}u(t) + e^{-2t}u(t)$

(ii) $x(t) = t u(t)$

30. a. Realize the transfer function of the system in direct form I using Laplace transform.

(i) $H(s) = \frac{s^2 + 3s + 2}{s^2 + 2s + 2}$

(ii) $H(s) = \frac{s + 2}{s^2 + 3s + 5}$

(OR)

b. Find the inverse Laplace transform of

$$X(s) = \frac{3s^2 + 8s + 6}{(s+2)(s^2 + 2s + 1)}$$

31. a. Find DTFT of

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

(ii) $x(n) = \left(\frac{1}{2}\right)^{n-1} u(n-1)$

(OR)

b. Find the inverse z transform of $x(z) = \frac{z^2}{z^2 + z + 1}$.

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

Reg. No.

B.Tech. DEGREE EXAMINATION, MAY 2019
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

1. Which of the following system is time invariant?

(A) $y(t) = x(2t)$

(B) $y(t) = x(t) + x(t-1)$

(C) $y(t) = x(t/2)$

(D) $y(t) = x(-t)$

2. The odd and even components of signal $u(t)$ are

(A) $\cos t, \sin t$

(B) $\sin t, -\cos t$

(C) $\cos t, \sin t$

(D) $\cos t, -\sin t$

3. The system $y(n+2) + y(n+1) = x(n+2)$ is

(A) Causal and memory less

(B) Causal and has memory

(C) Is causal

(D) Is non causal

4. A signal can be represented in

(A) Time domain

(B) Frequency domain

(C) Z domain

(D) Time and frequency domain

5. The Laplace theorem of $i(t)$ is given by $I(s) = 2/s(1+s)$ as $t \rightarrow \infty$, the value of $i(t)$ tends to

(A) 0

(B) 1

(C) 2

(D) ∞

6. Fourier transform of a DC signal is

(A) 0

(B) 1

(C) π

(D) $2\pi\delta(\Omega)$

7. Laplace transform of $u(t-2)$ is

(A) e^{-2s}

(B) $\frac{e^{-2s}}{s}$

(C) $\frac{1}{s}$

(D) 1

8. If $L[f(t)] = F(s)$ then $L[f(t-T)]$ is equal to

(A) $e^{ST}F(s)$

(B) $e^{-ST}/F(s)$

(C) $e^{-ST}F(s)$

(D) $\frac{F(s)}{1-e^{-ST}}$

9. If two systems with $h_1(t)$ and $h_2(t)$ are connected in series, then the overall impulse response is
 (A) $h_1(t) * h_2(t)$ (B) $h_1(t) / h_2(t)$
 (C) $h_1(t) + h_2(t)$ (D) $h_1(t) - h_2(t)$
10. 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
11. DTFT of $u(n-k)$ is
 (A) $\frac{e^{j\omega k}}{1 + e^{-j\omega}}$ (B) $\frac{e^{j\omega k}}{1 - e^{-j\omega}}$
 (C) $\frac{e^{-j\omega k}}{1 - e^{j\omega}}$ (D) $\frac{e^{-j\omega k}}{1 + e^{j\omega}}$
12. If $X(Z) = Z\{x(n)\}$ then $Z\{x(-n)\}$ is
 (A) $X(-Z)$ (B) $X(Z+1)$
 (C) $X(Z^{-1})$ (D) $X(Z-1)$
13. The direct evaluation of DFT requires _____ complex multiplications.
 (A) $N(N-1)$ (B) $N(N+1)$
 (C) N^2 (D) $\frac{N(N-1)}{2}$
14. If the output of discrete LTI system is always identical to the input signal, then the unit impulse response $h(n)$ is
 (A) Unit impulse (B) Exponential
 (C) Ramp (D) Unit step
15. ROC of a finite duration causal sequence is
 (A) Entire Z plane except at $Z=0$ and ∞ (B) Entire Z plane except at $Z=0$
 (C) Entire Z plane (D) Entire Z plane except at $Z=\infty$
16. The discrete time system is $y(n) + \frac{1}{4}y(n-1) = x(n) + \frac{1}{2}x(n-1)$ then $H(z)$ is
 (A) $z + \frac{1}{2}$ (B) $z + \frac{1}{4}$
 (C) $\frac{z+1/2}{z+1/4}$ (D) $\frac{1}{z} + \frac{1}{2}$
17. $x(n) * h(n) = h(n) * x(n)$ belongs to _____ property.
 (A) Associative (B) Commutative
 (C) Distributive (D) Time shifting
18. The impulse response of a system defined by $H(z) = Z^{-m}$ is
 (A) $u(n-m)$ (B) $\delta(n-m)$
 (C) $\delta(m)$ (D) $\delta(m-n)$

19. The z transform of a system is $H(z) = \frac{z}{z-0.2}$ if the roc is $|z| < 0.2$, then impulse response is

- (A) $(0.2)^n u(n)$ (B) $-(0.2)^n u(n)$
 (C) $(0.2)^n u(-n-1)$ (D) $-(0.2)^n u(-n-1)$

20. A signal that is zero for _____ is a causal signal.

- (A) $t > 0$ (B) $t < 0$
 (C) $t < t_0$ (D) $t > t_0$

PART - B (5 × 4 = 20 Marks)

Answer ANY FIVE Questions

21. Define and plot the following continuous time signals

- (i) Unit step
 (ii) Unit impulse

22. Find the even and odd component of $x(t) = \cos t + \sin t$.

23. Compute the inverse Fourier transform $F(j\Omega) = j\Omega / (2 + j\Omega)^2$.

24. Find z transform of $x(n) = \left(\frac{1}{2}\right)^n u(n)$.

25. Find z transform of $n a^n u(n)$.

26. Obtain the direct form-I realization for the system described by the difference equation.

$$y(n) - \frac{5}{6}y(n-1) + \frac{1}{6}y(n-2) = x(n) + 2x(n-1).$$

27. Explain the properties of Fourier transform.

PART - C (5 × 12 = 60 Marks)

Answer ALL Questions

28. a. Which of the following signals are energy and power signal.

- (i) $x(t) = e^{-3t} u(t)$
 (ii) $x(t) = e^{j(2t+\pi/4)}$

(OR)

- b. Sketch the following signals $x(n) = \{2, 1, -1, 3\}$

↑

- (i) $x(n-3)$
 (ii) $x(-n-2)$
 (iii) $x(-n+1)$
 (iv) $x(2n)$