

**B.Tech. – VIEP – ELECTRONICS AND
COMMUNICATION ENGINEERING (BTECVI)**

Term-End Examination

00549

December, 2017

BIEL-007 : SIGNALS AND SYSTEMS

Time : 3 hours

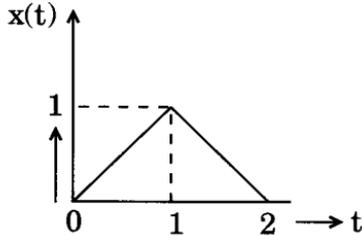
Maximum Marks : 70

***Note :** Attempt any **seven** questions. All questions carry equal marks. Symbols used have their usual meanings.*

1. (a) Distinguish between Power signal and Energy signal. Give an example of each. 4
- (b) $x(t)$ is an energy signal with energy E over all time ($-\infty < t < \infty$). If this signal is scaled, both in magnitude and in time to become $ax(bt)$, then what will be its energy? 3

- (c) Determine whether the following signal is a power or energy signal or neither. If it is a power or energy signal, find the magnitude $x(t) = u(t)$. 3

2. (a) Determine the even and odd component of the following signal : 2



- (b) Sketch the following signals : 4×2=8
- (i) $x(t) = u(t) u(a - t)$
- (ii) $x(t) = r(t + 1) - r(t) - u(t - 2)$
- (iii) $x[n] = u[n] - u[n - 1]$
- (iv) $x[n] = u[n] u[3 - n]$

3. (a) Distinguish between Time Varying and Time Invariant systems. Give an example of each.

Check whether the following input-output relationship is time invariant or not :

$$y(t) = x(2t) \quad 7$$

- (b) Explain briefly, Memoryless System, with the help of an example. 3

4. What is meant by Impulse Response of a system ? What is its importance ? The input to an LTI system is given by $x(t) = u(t) - u(t - 4)$ and the impulse response of the system is $h(t) = 2e^{-at} u(t)$. Find the output of the system $y(t)$. 3+7=10

5. With relevant waveforms discuss the types of symmetry present in the periodic waveform. How does each type of symmetry help in simplifying the calculation ? 10

6. (a) Starting from the expression of exponential Fourier series, derive the expression for Fourier transform of a signal. State the utility of Fourier transform. 5

(b) What will be the Fourier transform of a DC signal having unit strength ? Also draw its amplitude spectrum. 3

(c) Write the differential equation corresponding to the following transform equation : 2

$$I(\omega) = \frac{5}{(j\omega + 1)} - \frac{5}{(j\omega + 2)}$$

7. (a) If $x[n] \Leftrightarrow X(e^{j\omega})$, then show that $x[n - n_0] \Leftrightarrow X(e^{j\omega}) e^{-j\omega n_0}$. 5

(b) Using the above relation determine the Fourier transform of the signal $y[n] = x[1 - n] + x[-1 - n]$. 5

8. (a) State the final value theorem for z-transform and derive the mathematical formulation of the theorem.

Hence find the final value of the signal corresponding to the following z-transformation :

7

$$X(z) = \frac{1 + z^{-1}}{1 - 0.25 z^{-2}}$$

- (b) A unit step function (its z-transform is $\frac{z}{z-1}$) is sampled every T seconds. What would be the z-transform of a sampled step delayed by T second ?

3

9. (a) Find the inverse z-transform of

$$X(z) = \frac{z}{z - 0.5} \quad |z| > 0.5.$$

5

- (b) An LTI system is given by the difference equation

$$y[n] + 2y[n - 1] + y[n - 2] = x[n].$$

Determine the unit impulse response.

5

10. Write short notes on the following :

2×5=10

- (a) Singularity Functions and their Advantages
- (b) Fourier Transform of Periodic Impulse Train