

Total Pages—4

B.Tech - 6th
Signals and Systems - I

(Set-R₁)

Full Marks : 70

Time : 3 hours

Answer six questions including Q. No. 1
which is compulsory

The figures in the right-hand margin indicate marks

1. Answer the following questions : 2 × 10
- (a) Define periodic signal and nonperiodic signal.
- (b) Define discrete time signals and classify them.
- (c) Write down the trigonometric form of the fourier series representation of a periodic signal.
- (d) Write short notes on dirichlets conditions for fourier series.

- (e) Define Bilateral and unilateral laplace transform.
- (f) State the linearity property for laplace transform.
- (g) State initial value theorem and final value theorem for laplace transform.
- (h) Define Z transform.
- (i) State multiplication property in relation to Z transform.
- (j) State the significance of block diagram representation.

2. Distinguish between the following : $2\frac{1}{2} \times 4$
- (a) Continuous time signal and discrete time signal.
- (b) Unit step and Unit Ramp functions.
- (c) Periodic and Aperiodic Signals.
- (d) Deterministic and Random Signals.

(Turn Over)

3. (a) Find whether the following signal

$$f(t) = 2\cos(10t + 1) - \sin(4t - 1)$$

is periodic or not.

- (b) Find the summation.
 (c) Explain the properties of unit impulse function.
 (d) Find the fundamental period T of the continuous time signal.

$$f(t) = 20 \cos(10\pi t + \pi/6) \quad 2\frac{1}{2} \times 4$$

4. (a) Determine the Fourier Transform for double exponential pulse whose function is given by $f(t) = e^{-2|t|}$. Also draw its magnitude and phase spectra. 5

- (b) Obtain inverse Laplace Transform of the function

$$X(s) = \frac{1}{s^2 + 3s + 2}, \quad \text{ROC: } -2 < \text{Re}\{s\} < -1 \quad 5$$

5. The LTI system is characterized by impulse response for given by

$$H(s) = \frac{1}{s+10} \quad \text{Roc: } \text{Re} > 10.$$

Determine the output of a system when it is excited by the input $x(t) = -2u(-t) - 3u(t)$. 10

6. (a) State and prove the convolution Property of Z-Transform. 5
 (b) Obtain the relationship between DFT and Z-transform. 5

7. Determine the transfer function and impulse response for the causal LTI system described by the equation using Z transform

$$Y(n) - 1/4y(n-1) - 3/8y(n-2) = -x(n) + 2x(n-1) \quad 10$$

8. What is the overall impulse response $h(n)$ when two system with impulse response $h_1(n)$ and $h_2(n)$ are connected in parallel and in series? 10