



- Notes :
1. All questions carry marks as indicated
  2. Assume suitable data wherever necessary.
  3. Illustrate your answers wherever necessary with the help of neat sketches.
  4. Use of slide rule, Logarithmic tables is permitted.
  5. Non programmable calculator is permitted.
  6. Due credit will be given to neatness and adequate dimensions.

1. a) Determine whether the following signals are periodic or aperiodic, If periodic, determine its fundamental period. 8
- i)  $x(t) = \sin 12\pi + \cos 20\pi t$                       ii)  $x(t) = \sin \pi t \cdot u(t)$
- b) Define and explain basic types of signals. 8
- i) Unit step signal.                                      ii) Ramp signal
- iii) Unit Impulse signal                                  iv) Sinusoidal signal

**OR**

2. a) Check for linearity of following system. 8
- i)  $y(t) = \sin(x(t))$                                       ii)  $y(t) = \sin(t) \cdot x(t)$
- b) Check whether following systems are causal or non-causal. 8
- i)  $y(t) = x^2(t) + x(t-3)$                                   ii)  $y(t) = x(3-t) + x(t-2)$
- iii)  $y[n] = x[2n]$     iv)  $y[n] = \sin(x[n])$
3. a) Find the convolution using graphical method for the signals. 8
- $x(t) = e^{-2t}u(t); h(t) = u(t+5)$
- b) State and explain the properties of LTI system. 8

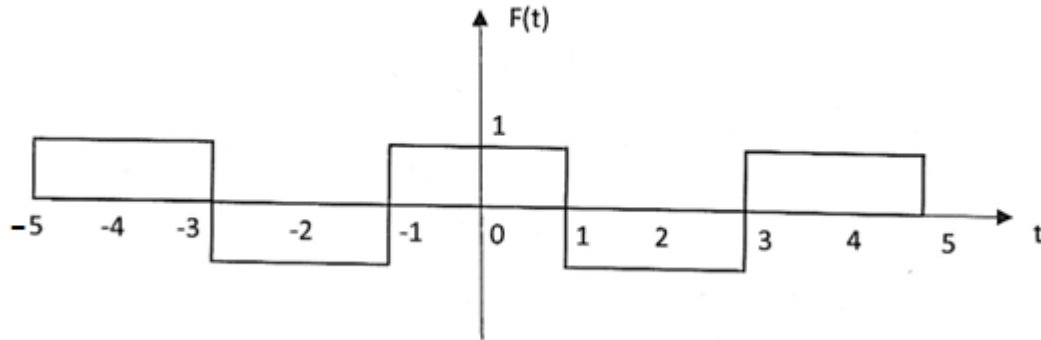
**OR**

4. a) Perform the convolution of following signals. 8
- $x_1(t) = tu(t); x_2(t) = e^{-2t}u(t)$
- b) Find the frequency response and impulse response of the given system. 8
- Input  $x(t) = e^{-t}u(t)$ ; output  $y(t) = e^{-2t}u(t) + e^{-3t}u(t)$
5. a) Find the Fourier transform of signal  $x(t) = e^{-at} \cdot u(t)$  plot its magnitude and phase spectrum. 8
- $a > 0$ .
- b) State and explain Parseval's theorem. 8

**OR**

6. a) State and explain the sufficient condition for the existence of a Fourier transform of discrete time signal. 8

b) Calculate Fourier coefficient of given Square wave of time  $T = 4$  and amplitude 1. 8



7. a) Determine z-Transform for discrete time signal. 8

$$x[n] = (0.5)^n \cdot U[n] + (2)^n u[-n-1]$$

b) Explain the properties of Laplace transform. 8

- |                     |                               |
|---------------------|-------------------------------|
| i) Time scaling.    | ii) Integration in frequency. |
| iii) Time shifting. | iv) Differentiation in time.  |

**OR**

8. a) Determine the Laplace transform of given signal. 8

$$x(t) = e^{-5t}u(t) + e^{-t}u(-t)$$

$$x(t) = e^{-3t}(2\cos 5t - 3\sin 5t)$$

b) Determine z-Transform for discrete time signals. 8

i)  $x[n] = (2)^n \cdot u[-n-3]$

ii)  $x(n) = (5)^n u[n]$ . Also find ROC.

9. a) What is Filter? Write and explain types of filters. 8

b) Elaborate on feedback control systems and its types; also describe the effects of feedback control systems. 8

**OR**

10. a) Relation between continuous and discrete time systems. 5

b) State and prove sampling theorem. 5

c) An analog signal is given as 6

$$x(t) = \sin(5\pi t) + 2\sin(10\pi t) + 2\cos(15\pi t)$$

Determine:

- Nyquist sampling rate
- Discrete time signal obtained after sampling if sampling rate  $F_s = 20H_z$

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