

**B.Tech. SEM -III Electronics / Bio Medical / E & TC) 2014 Course  
(CBCS) : SUMMER - 2019  
SUBJECT : SIGNALS AND SYSTEMS**

Day : Monday  
Date : 13/05/2019

Time : 02.30 PM TO 05.30 PM  
Max. Marks : 60

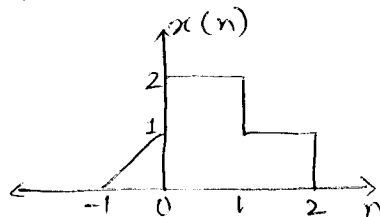
S-2019-2567

**N. B. :**

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Draw neat and labeled diagram **WHEREVER** necessary.
- 4) Assume suitable data, if necessary.

- Q. 1 a)** Determine whether or not each of the following signals is periodic. If a signal is periodic, specify its fundamental period. **(06)**
- i.  $x(t) = e^{(-1+j)t}$
  - ii.  $x(n) = 3e^{j3\pi(n+\frac{1}{2})/5}$
  - iii.  $x(n) = 3e^{j3/5(n+1/2)}$

- b)** Sketch the following signals for given  $x(n)$ : **(04)**
- i.  $x(3n+1)$
  - ii.  $x(n-2)\delta(n-2)$



**OR**

- a)** What is impulse signal? State and prove three properties of impulse signal. **(06)**
- b)** Determine the energy and power of the following signals **(04)**
  - i.  $x(t) = 0.9e^{-3t}u(t)$
  - ii.  $x(n) = (\frac{1}{2})^n u(n)$

- Q. 2 a)** Compute and plot the convolution of  $x(n) = \delta(n) + 2\delta(n - 1) - \delta(n - 3)$  and  $h(n) = 2\delta(n + 1) + 2\delta(n - 1)$ . **(07)**

- b)** What is causality for LTI systems? **(03)**

**OR**

- a)** Determine if the following system is causal and/or stable: **(06)**
  - i.  $h(n) = (-\frac{1}{2})^n u(n) + (1.01)^n u(n - 1)$
  - ii.  $h(t) = e^{-6t}u(3 - t)$

- b)** What is convolution? State all the properties of convolution. **(04)**

- Q. 3 a)** What is Fourier series? What are the conditions for the convergence of Fourier series? **(04)**

- b)** Sketch the Fourier Transform of the given signal **(06)**

- i.  $x(t) = (e^{-at} \cos(\omega t)) u(t), a > 0$
- ii.  $x(t) = \frac{1}{2}x_1(t - 2.5) + x_2(t - 2.5)$

**P. T. O.**

OR

- a) State and prove convolution theorem and frequency convolution properties of Fourier Transform. (06)
- b) Use the Fourier Transform synthesis equation to determine the inverse Fourier Transform of: (04)

$$X(j\omega) = \begin{cases} 2 & \text{for } 0 \leq \omega \leq 2 \\ -2 & \text{for } -2 \leq \omega \leq 0 \\ 0 & \text{where } |\omega| > 2 \end{cases}$$

- Q. 4 a) Determine the Laplace Transform and draw the ROC of (06)
- $$x(t) = e^{-2t}u(t) + e^{-t} \cos(3t) u(t)$$
- b) What is ROC of Laplace Transform? State any two properties of Laplace Transform. (04)

OR

- a) What is differentiation in s-domain and find Laplace Transform of (05)
- $$x(t) = te^{-at}u(t)$$
- b) Determine the Laplace inverse of (05)

$$X(s) = \frac{(s+1)}{(s+1)^2 + 9}$$

- Q. 5 a) If  $x(n)$  and  $X(z)$  are Z-transform pair, find  $x(n)$ , if (07)
- $$X(z) = \frac{(4z^2 - 2z)}{(z^3 - 5z^2 + 8z - 4)}$$
- By partial fraction method.
- b) Is the transformation from Laplace Transform to Z-transform possible? If yes, how? (03)

OR

- a) If  $Z\{x(n)\}=X(z)$  and  $Z\{y(n)\}=Y(z)$ , then find  $Z\{R_{xy}(m)\}$ , where  $R_{xy}$  is correlation function. (05)
- b) What is ROC of Z-transform? Explain right sided, left sided and two sided ROC. (05)

- Q. 6 a) What is impulse train sampling? (05)
- b) Find  $R_{xy}$ , if  $x(n)=\{1,1,2,2\}$  and  $y(n)=\{1,3,1\}$ . (05)

OR

- a) What is the difference between convolution and correlation? (04)
- b) Prove that  $R_{xx}(0) = E_x$ . (03)
- c) What is aliasing? (03)

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