B. Tech sem-III All Branch.

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. $x(t) = e^{(-1+j)t}$

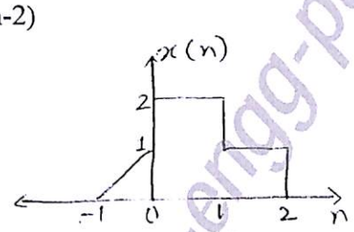
ii. $x(n) = 3e^{j3\pi(n+\frac{1}{2})/5}$

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)δ(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)**

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

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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