TE-sem-V-old- EXTC

SS

7/12/15

QP Code : 1764

(OLD COURSE)

(3 Hours) [Total Marks : 100

N.B. (1) Question no. 1 is compulsory
(2) Answer any **four** questions out of remaining **six** questions
(3) **Figure** to **right** indicates **full** marks
(4) **Illustrate** the answers with **sketches** whenever **required.**

1. (a) Prove differentiation in Z domain property of Z transform. 5
(b) Determine the direct form-I realisation of the following transfer function 5
$H(z) = 1 - 0.7z^{-1} + 0.4z^{-2}$
(c) Let x[n] =u[n]-u[n-5]. Find and sketch even and odd parts of x[n] 6
(d) Determine whether the following signals are energy signals or power signals? Calculate their energy or power 4
(i) $x(t) = A\cos(2\pi f_0 t + \theta)$
(ii) $x(n) = \left(\frac{1}{4}\right)^n u(n)$

2. (a) Convolve $x(t) = 1 \quad 0 \le t < 1$
$= 0$ elsewhere
with $h(t) = 1 \quad 0 \le t < 1$
$= 0$ elswhere 10

(b) Consider the analog signal $x(t) = 8\sin 200\pi t$ 10
(i) Determine minimum required sampling rate to avoid aliasing.
(ii) If the signal is sampled at the rate Fs =100Hz.
What is discrete time signal obtained after sampling.
(ii) If the signal is sampled at the rate Fs=300Hz, what is discrete time signal obtained after sampling.

3. (a) Determine the exponential form of Fourier series representation of signal shown below in fig 3(a). Hence determine the trigonometric form of Fourier series. 10

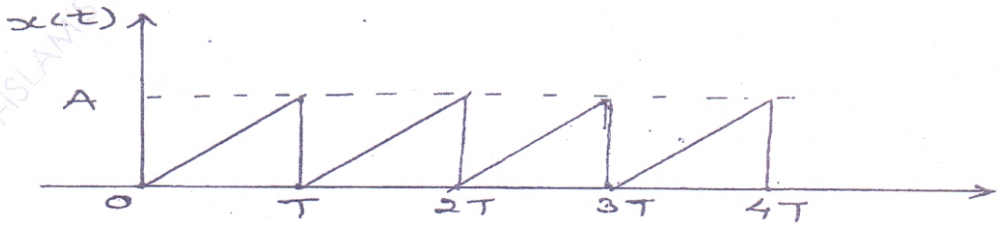

Fig. 3(a)

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(b) Determine the output response of the system $h(t) = u(t)$ to an input $x(t) = e^{-at}u(t)$, $a > 0$ — 10

4. (a) Find z transform along with its ROC of — 10

(i) $x[n] = \left(\frac{-1}{5}\right)^n u(n) + 5\left(\frac{1}{2}\right)^n U(-n-1)$

(ii) $x[n] = 2^n u(n-2)$

(b) Prove that LTI system is stable if it's impulse response is absolutely summable — 10

5. (a) Obtain the inverse Laplace transform of — 10

(i) $x(s) = \frac{5s^2 - 15s - 11}{(s+1)(s-2)^3}$ (ii) $x(s) = \frac{s-3}{s^2 + 4s + 13}$

(b) Realize Direct Form-I, Direct Form-II, First order cascade and First order paraller structures if — 10

$$x(z) = \frac{1 + 3z^{-1} + 2z^{-2}}{\left(1 + \frac{1}{8}z^{-1}\right)\left(1 + \frac{1}{2}z^{-1}\right)\left(1 - \frac{1}{4}z^{-1}\right)}$$

6. (a) The difference equation of the system is given by
$y(n) = 3y[n-2] + 4[n-1] + x[n]$
If $x[n] = [0.5]^n u[n]$ and
$y[-1] = 1, y[-2] = 0$
Find (i) Zero Input Response
(ii) Zero State Response
(iii) Total Response — 10

(b) Prove time sifting property of Fourier transform — 5

(c) Determine the unit step response of the system whose impulse response is given as $h(t) = 3t\,u(t)$ — 5

7. (a) Determine the state variable model of
$y[n] = -2y[n-1] + 3y[n-2] + 0.5y[n-3] + 2x[n]$ — 10

(b) Usign a suitable method obtain state transition matrix e^{AT} for the following system $\begin{bmatrix} 3/4 & 0 \\ -1/2 & 1/2 \end{bmatrix}$ — 10
