(Please write your Exam Roll No.) Exam Roll No. .....

END TERM EXAMINATION

FIFTH SEMESTER [B.TECH.] DECEMBER 2016

Paper Code: IT-307 **Subject: Digital Signal Processing**

Time: 3 Hours **Maximum Marks: 60**

Note: Attempt any five questions including Q no.1 which is compulsory. Assume suitable missing data, if any.

Q1 (a) Check the system $y(n)=a^n u(n)$ for stability. **(3)**

(b) Check $y(n)=\sin(n)x(2n-5)$ for Time-Invariance and $y(n)=\sin(n+3)x(n-4)+x(n+2)$ for Causality. **(3)**

(c) Find IR of system $y(n)+4y(n-1)+4y(n-2)=r(n-2)$ **(3)**

(d) Perform convolution of two periodic sequences $x_1(n)=\{1,2,3,4\}$ and $x_2(n)=\{5,6,7,8\}$ using Circular convolution. **(3)**

Q2 (a) The IR of a FIR filter, $h(n)=\delta(n)+\frac{1}{4}\delta(n-1)+\frac{1}{16}\delta(n-2)$. Find the response of this filter to $x(n)=\sin\left(\frac{n\pi}{2}\right)u(n)$ **(6)**

(b) Frequency response of a FIR filter is given as $H(e^{jw})=e^{-3Jw}[2+1.8\cos 3\omega t+1.2\cos 2\omega t+0.5\cos \omega t]$ Find IR of filter and identify filter type based on its passband. **(6)**

Q3 (a) Prove Initial Value Theorem of Z Transform. **(6)**

(b) Two systems having IR $h_1(n)=\left(\frac{1}{4}\right)^n u(n)$. And $h_2(n)=\left(\frac{1}{2}\right)^n u(n)$ are connected in cascade find the next IR. **(6)**

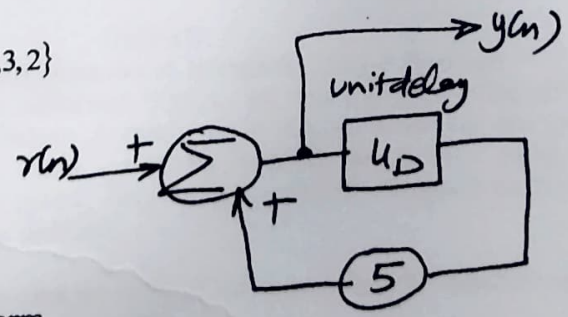
Q4 (a) Show that the magnitude response of an FIR filter at DC can be obtained as $|H(0)|=\left|\sum_{n=0}^{N-1}h(n)\right|$ and at frequency $w=\pi$ as $|H(\pi)|=\left|\sum_{n=0}^{N-1}\cos n\pi h(n)\right|$. **(6)**

(b) For the DTS shown, find **(6)**

(i) LDE

(ii) IR

(iii) Output if $r(n)=\{1,3,2\}$



Q5 Discuss-

(a) Properties of z-transform. **(6)**

(b) Linear convolution using DFT. **(6)**

Q6 The TF of a DT Causal system is $H(z)=\dfrac{1-\frac{1}{2}z^{-1}}{1-z^{-1}+\frac{3}{16}z^{-2}}$ obtain **(12)**

(a) Difference Equation.

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(b) Show DF-I, DF-II, Cascade and Parallel realization of this system.
(c) Find IR, step response and response to input

(i) $x(n)=\left(\frac{1}{2}\right)^n u(n)$ [an exponential excitation]

(ii) $x(n)=2\sin\left(\frac{\pi n}{3}-\frac{\pi}{5}\right)$ [a sinusoidal excitation]

Q7 Derive & explain the decimation in Time & Decimation in Frequency techniques for evaluating FFT. **(12)**

Q8 (a) The signal $f(t)=(0.8)^t u(t)$ is discretized to $f(n)=(0.8)^n u(n)$ having infinite length. Find the DFT of this signal, may be evaluated through an 8-point rectangular window. **(6)**
(b) Write short note on IIR filters. **(6)**

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