(Please write your Exam Roll No.) (1) Exam Roll No. .....

END TERM EXAMINATION

SIXTH SEMESTER [B.TECH.] MAY-2010

Paper Code: ETIT/ETIC/ETEE308 **Subject: Digital Signal Processing**

Time : 3 Hours **Maximum Marks :75**

Note: Attempt one question from each unit including Q.1 which is compulsory.

Q1 (a) Define DFT of a periodic sequence x(n) with length N of its period. Derive the expression to obtain the sequence x(n) from its DFT X(k). **(4)**

(b) Give the sequences defining at least five different window functions w(n), commonly used in FIR filter designer. **(4)**

(c) Define the Chebyshev polynomial $C_N(x)$. Obtain the recursive relation to build up higher order Chebyshev polynomials. **(4)**

(d) Obtain DTFT for x(n)=u(n). **(4)**

(e) An FIR digital filter satisfies the condition h(n)=h(N-1-n), where h(n) is it impulse response and N is its length. Determine $H(e^{j\omega})$ if N is an odd integer. **(4)**

(f) $H(z)=\frac{N(z)}{D(z)}$ Is an all pass filter. If $N(z)=a_0+a_1z^{-1}+a_2z^{-2}$ and a0, a1, a2 are real constants, what will be the expression for D(z)? Justify your answer by proof. **(5)**

UNIT-I

Q2 (a) Find the z transforms, giving ROC in each case (*i*) $x(n)=\sin n\omega_0.\mu(n)$ (*ii*) $x(n)=-a^nu(-n-1)$. **(3+3)**

(b) Find inverse z-transform given $X(z)=\log(1-2z),\ |z|<\frac{1}{2}$. **(3)**

(c) Determine the frequency response of the system characterized by $y(n)=(5/6)y(n-1)-\left(\frac{1}{6}\right)y(n-2)+x(n)$. **(3.5)**

Q3 (a) Show that $\sum_{n=-\infty}^{\infty}|x(n)|^2=\frac{1}{2\pi}\int_{-\pi}^{\pi}\left|X(e^{j\omega})\right|^2 d\omega$. **(4)**

(b) If x(n) is real and even show that its DTFT, $X(e^{j\omega})$ is also real and even. **(4)**

(c) Find the DTFT of the periodic sequence given by $\sum_{k=-\infty}^{\infty}\delta(n-kN)$. **(4.5)**

UNIT-II

Q4 (a) Define circular convolution of two periodic sequences $x_1(n)$ *and* $x_2(n)$. Show that $x_1(n)$ N $x_2(n)$ gives DFT as $X_1(k).X_2(k)$. **(3)**

(b) If $x(n)\underline{DFT}X(k)$, find the DFT of X(n). **(3)**

(c) Why FFT is so important? What are its advantages? Develop the DIT-FFT algorithm. Draw the complete flow diagram taking sequence length N=8. **(6.5)**

Q5 (a) Given the system function: $H(z)=\frac{Z^{-1}(1+3z^{-1}+4z^{-2})}{1+7z^{-1}+6z^{-2}+5z^{-3}}$ find the state variable $\underline{A_1}\ \underline{B_1}\ \underline{C_1}$ *and* $\underline{D}$. **(4)**

P.T.O.

Q3 (a) What are the various data link layer design issues? Explain stop-and-wait ARQ protocol with suitable diagrams when (i) Frame is lost (ii) ACK is lost. **(7)**

(b) Name different types of HDLC frames and give a brief description of each. **(5.5)**

OR

Q3 (a) Explain the encapsulation of PDUs in TCP/IP and addressing with suitable diagrams. **(4.5)**

(b) How is CRC superior to the two-dimensional parity check? How does the checksum checker know that the received data unit is undamaged? **(8)**

Q4 (a) What do you mean by multiple access communication? What is the role of MAC protocols? **(5.5)**

(b) Explain Ethernet protocol with special reference to frame format. **(7)**

OR

Q4 (a) Discuss the following with reference to LANs. **(6.5)**
(i) Exponential back off algorithm (ii) CSMA/CD vs CSMA/CA

(b) What is the maximum number of subnets in each case? **(6)**
(i) Class A; mask 255.255.192.0
(ii) Class B; mask 255.255.192.0
(iii) Class C; mask 255.255.255.192
(iv) Class C; mask 255.255.255.240

Q5 (a) Explain the leaky bucket algorithm and illustrate how traffic congestion can be reduced. **(7)**

(b) A routing algorithm should have global knowledge about the state of the network to perform its task. Give various goals and objective to be considered in routing algorithms. **(5.5)**

OR

Q5 (a) Explain the Leaky bucket algorithm to control congestion. Explain how the drawbacks of this are overcome in a token bucket algorithm? **(6)**

(b) Are both UDP and IP unreliable to the same degree? Why or why not? **(4)**

(c) Can the value of header length in an IP packet be less than 5? When is it exactly 5? **(2.5)**

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