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Name: Reg No.: APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY SEVENTH SEMESTER B. TECH DEGREE EXAMINATION(S), MAY 20 **Course Code: EE407 Course Name: DIGITAL SIGNAL PROCESSING Duration: 3 Hours** Max. Marks: 100 PART A Marks Answer all questions, each carries 5 marks. What is the need of zero padding? Obtain linear convolution of the sequence (5) 1 $x(n) = \{1,2,3\}, h(n) = \{-1,-2\}$ using circular convolution. Realize the system function using minimum number of multipliers (5) 2 $H(z) = (1 + Z^{-1})(1 + \frac{1}{2}Z^{-1} + \frac{1}{2}Z^{-2} + Z^{-3})$ (5) For the analog transfer function $H(s) = \frac{10}{(s^2+7s+10)}$, determine H(z) using 3 impulse invariant method for T=0.2 sec (5) Compare Hamming and Barlett windows with required equations. 4 Express the fraction 7/8 and -7/8 in sign magnitude, 1's complement and 2's (5)5 complement. (5) What is zero input limit cycle oscillation? 6 What are the different buses of TMS 320 C24x processor and their functions? (5) 7 Define any 5 arithmetic and logic instructions in TMS 320 C24x processor. (5)

PART B

Answer any two full questions, each carries 10 marks.

- Determine the 8-point DFT of the following sequence. 9 x(n)={0.5, 0.5, 0.5, 0.5, 0, 0, 0, 0}.Using radix-2 decimation in time FFT algorithm.
- 10 a) Perform the linear convolution of the following sequence by Overlap save (5)method. $x(n) = \{1, 2, 3, -1, -2, -3, 4, 5, 6\}$ and $h(n) = \{2, 1, -1\}$

b)	Obtain direct form II realization of a system described by,	(5)
	$y(n) - \frac{3}{4}y(n-1) + \frac{1}{8}y(n-2) = x(n) + \frac{1}{2}x(n-1)$	

(10)Obtain the cascade and parallel realizations for the system function 11

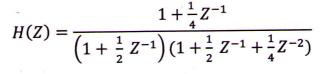
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PART C

Answer any two full questions, each carries 10 marks. Design a digital Butterworth filter satisfying the constraints: $0.9 \leq |H(e^{jw})| \leq 1$ for $0 \le w \le \pi/2$ $\left|H(e^{jw})\right| \le 0.2$ for $3\pi/4 \le w \le \pi$,

with T=1 sec using bilinear transformation.

13 a) Write down the transfer function H(s) of a 2^{nd} order Chebyshev low pass filter (6) with 3 dB cut-off frequency of 1 rad/sec. Determine H(z) by using approximation of derivative method with a sampling interval of 1 sec.

- b) Compare IIR and FIR filters.
- Design a high pass filter with a frequency response

$$\operatorname{H}(e^{jw}) = 1$$
, $\frac{\pi}{6} \leq |w| \leq \pi$

using Hanning window. Take N=7

PART D Answer any two full questions, each carries 10 marks.

- a) Draw the product quantization noise model of a second order IIR system. (5)15
 - Two first order filters are connected in cascade whose system functions of the (5)b) $H_1(z) = 1/(1-0.5z^{-1})$ and $H_2(z) = 1/(1-0.6z^{-1})$. are individual sections Determine overall output noise power.
- Obtain the limit cycle behaviour of the system described by (5)16 a) y(n) = Q[ay(n-1)] + x(n), where y(n) is the output of the filter and Q[.] is the rounded operation. Assume $a = \frac{7}{8}$, $x(0) = \frac{3}{4}$ & x = 0, for n > 0 choose 4 bit sign magnitude.
 - b) What are the functions of TREG and PREG in TMS 320 C24x processor? (5)
- Draw and describe the functional block diagram of TMS 320 C24x processor. (10)17 ****

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