

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Seventh Semester B.Tech Degree Regular and Supplementary Examination December 2021 (2015 Scheme)

Course Code: EE407**Course Name: DIGITAL SIGNAL PROCESSING**

Max. Marks: 100

Duration: 3 Hours

PART A*Answer all questions, each carries 5 marks.*

Marks

- 1 Explain the important aspects of linear filtering based on DSP (5)
- 2 Obtain Direct form-II realization of a discrete system represented by transfer function $y(n) = \frac{1}{2}y(n-1) + \frac{1}{4}y(n-2) + x(n) + x(n-1)$ (5)
- 3 Convert the analog filter given by transfer function $H_a(s) = \frac{3s}{s^2+0.5s+2}$ to a digital filter by using bilinear transformation for T=1s (5)
- 4 Explain the important steps involved in designing an FIR filter using frequency sampling technique. (5)
- 5 Explain about coefficient quantisation error and its effect in digital filters (5)
- 6 Explain different formats of fixed point and floating point representation of binary numbers. (5)
- 7 Explain briefly about Dual access RAM(DARAM) and Flash EEPROM in C24x processor (5)
- 8 Define the function of (i) Program Counter(PC) (ii) Repeat counter(RPTC) in C24x processor. (5)

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

- 9 Find the 8-point DFT of the sequence $x(n) = \{1,2,2,3,3,4,1,1\}$ using Decimation in Time FFT Algorithm. (10)
- 10 a) Perform circular convolution of the following sequences $x_1(n) = \{1,3,2,1\}$; $x_2(n) = \{2,2,3,4\}$ using (i) Concentric circle method (ii) Matrix method (5)
- b) Obtain cascade realization of the system given by transfer function (5)

$$H(z) = \frac{2+Z^{-1}+Z^{-2}}{(1+\frac{1}{2}Z^{-1})(1-\frac{1}{2}Z^{-1})(1+\frac{1}{2}Z^{-1})}$$

- 11 Obtain the lattice structure realization of the difference equation given by (10)

$$y(n) = 4x(n) + \frac{26}{12}x(n-1) + \frac{10}{4}x(n-2) + \frac{4}{3}x(n-3)$$

PART C

Answer any two full questions, each carries 10 marks.

- 12 (a) Find the analog transfer function of Chebyshev IIR filter for the following (5)
 specifications using bilinear transformation. Take sampling time T=1s.

$$\sqrt{0.5} \leq |H(\omega)| \leq 1, \quad 0 \leq \omega \leq 0.2\pi$$

$$|H(\omega)| \leq 0.1, \quad 0.6\pi \leq \omega \leq \pi$$

- (b) With relevant equations, explain Bartlett and Blackman windows (5)
- 13 Design a Butterworth IIR digital filter with the following specifications using (10)
 bilinear transformation. Take sampling time T=1s.
 3dB ripple in passband $0 \leq \omega \leq 0.2\pi$
 25dB attenuation in stopband $0.45\pi \leq \omega \leq \pi$

- 14 Design a filter with $H_d(\omega) = e^{-j3\omega}$, $-\frac{\pi}{4} \leq \omega \leq \frac{\pi}{4}$ (10)
 $=0$, $-\frac{\pi}{4} \leq |\omega| \leq \pi$

Using a Hamming window with N=7

PART D

Answer any two full questions, each carries 10 marks.

- 15 a) For a second order IIR filter with $H(z) = \frac{1}{(1-0.8z^{-1})(1-0.6z^{-1})}$, Discuss the (5)
 effect on pole locations of the given system function in direct form and in
 cascade form with 3 bit coefficient representation (b=3 bits).

- b) With neat diagram explain the Central Arithmetic Logic Unit in TMS 320 (5)
 C24X processor.

- 16 a) Explain any 5 control instructions in TMS 320C24x processor (5)

- b) Discuss about the internal bus structure of TMS 320C24x processor (5)

- 17 In the IIR system given by $H(z) = \frac{1}{(1-0.4z^{-1})(1-0.7z^{-1})}$ the products are (10)

rounded to 4 bits (including sign bit). Find the output round off noise power in
 cascade realization for the order of cascading $H_1(z)H_2(z)$

Where $H_1(z) = \frac{1}{(1-0.4z^{-1})}$ and $H_2(z) = \frac{1}{(1-0.7z^{-1})}$
