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Reg No.:_____ Name:_____

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

B.Tech Degree S7 (S, FE) / S7 (PT) (S, FE) Examination December 2023 (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 | Find DFT of $x(n) = [2\ 3\ 4\ 4]$ | (5) |
| 2 | Obtain the parallel form realization structure of a signal given by $y(n) = \frac{3}{4}y(n-1) - \frac{1}{8}y(n-2) + x(n)$ | (5) |
| 3 | Describe warping effect with a neat diagram | (5) |
| 4 | Compare Rectangular window and Hanning window | (5) |
| 5 | Write short notes on fixed- and floating-point arithmetic in DSP with suitable examples | (5) |
| 6 | Explain product quantization error and obtain the quantization model for a second order system. | (5) |
| 7 | What are the different interrupt registers used for controlling interrupts | (5) |
| 8 | Explain the addressing modes of TMS320C24x DSP Processor | (5) |

**PART B**

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

| | | | |
|---|---|---|---|
| 9 | | Find 8 point DFT of x(n) using radix -2 Decimation in Time (DIT) FFT algorithm x(n)={2,1,2,1,2,1,2,1} | (10) |
| 10 | a) | Perform the linear convolution of the following sequence using overlap save method x(n)={3,1,0,1,3,2,0,1,2,1} and h(n)={1,1,1} | (5) |
| | b) | Determine the cascade form realization of $H(z)=\frac{(1+\frac{1}{4}z^{-1})(1+\frac{1}{2}z^{-1})}{(1-\frac{1}{8}z^{-1})(1-\frac{1}{2}z^{-1})}$ | (5) |
| 11 | | Determine the direct form-I and direct form-II realization of the following function $y(n) = \frac{1}{4}y(n-1) - \frac{1}{8}y(n-2) + x(n) + \frac{1}{2}x(n-2)$ | (10) |

## PART C

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

12 Design a digital Butterworth filter satisfy following constraints (10)

$$0.707 \leq |H(e^{j\omega})| \leq 1 \text{ for } 0 \leq \omega \leq \frac{\pi}{2}$$

$$|H(e^{j\omega})| \leq 0.2 \text{ for } \frac{3\pi}{4} \leq \omega \leq \pi$$

With T= 1 sec using bilinear transformation

13 a) For the analog transfer function $H(s) = \frac{2}{(s+1)(s+2)}$ determine H(z) using impulse invariance method. (5)

b) Compare IIR and FIR filters (5)

14 Design a filter with $H_{d(}\omega) = e^{-3j\omega}$ for $\frac{-\pi}{4} \leq \omega \leq \frac{\pi}{4}$ (10)

$$=0 \quad \text{for} \quad \frac{-\pi}{4} \leq \omega \leq \pi$$

Using Hamming window with N=7

## PART D

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

15 a) What are the effects of finite word length in DSP system. (5)

b) Explain limit cycle oscillation. (5)

16 a) Write short notes on product round of noise and truncation error. (5)

b) Explain the elements of Central processing unit of TMS 320 C24x processor. (5)

17 Draw and describe the functional block diagram of TMS 320 C24x processor. (10)

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