FirstRanker.com Firstranker's choice

www.FirstRanker.com

Enrolwww.PirstRanker.com

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER- V (New) EXAMINATION - WINTER 2019 Subject Code: 2150307 Date: 06/12/2019 **Subject Name: Digital Signal Processing** Time: 10:30 AM TO 01:00 PM **Total Marks: 70 Instructions:** 1. Attempt all questions. 2. Make suitable assumptions wherever necessary. 3. Figures to the right indicate full marks. Q.1 Define Signal. Explain briefly classification of Signals. 03 (a) Determine whether following signals are periodic or not: **(b)** 04 (i) $x1(t) = sin15 \pi t$ (ii) $x^2(t) = \sin 20 \pi t$ (iii) $x3(t) = \sin\sqrt{2}\pi t$ (iv) x4(t) = x1(t) + x2(t)Explain in detail the overall block diagram of Digital Signal processing (c) 07 system. Q.2 Enlist properties of Z-Transform and prove any two properties of it. 03 **(a)** Give definition of following terms: 04 **(b)** 1. Energy Signal 2. Power Signal 3. Sampling Theorem 4. Quantization Error Determine the z – transform of sequence given by: 07 (c) $x(n) = \begin{cases} \left(\frac{1}{2}\right)^n, n = 0, 2, 4\\ \left(\frac{1}{3}\right)^n, n = 1, 3, 5 \end{cases}$ Find x (n) for given transfer function using PFE method and also 07 (c) validate your answer using long division method. $X(Z) = \frac{2 + 3z^{-1}}{(1 + z^{-1})(1 + \frac{1}{2}z^{-1})(1 - \frac{1}{4}z^{-1})}$ Q.3 Prove any three properties of DFT. 03 **(a)** Compute Linear convolution of following given sequence using **(b)** 04 mathematical method $x(n) = \{1, 1, 0, 1, 1\}$ & $h(n) = \{1, -2, -3, -4\}$ Find the inverse DFT of following response 07 (c) $X(k) = \{1, 2, 3, 4\}$

FirstRanker.com www.FirstRanker.com www.FirstRanker.com **Q.3** (a) Explain briefly application of Goertzel algorithm. 03 **(b)** 04 Determine $\mathbf{r}_{XX} \& \mathbf{r}_{XY}$ for following sequences: $x(n) = \{1, 2, 1, 1\}$ & $y(n) = \{1, 1, 2, 1\}$ Given $x(n) = 2^n$ and N = 8, find X (k) using DIT FFT algorithm. 07 (c) Q.4 Explain in brief the Cascade representation of Digital IIR system 03 (a) giving one example. Develop Direct form – I realization of following system: 04 **(b)** $H(Z) = \frac{0.28z^2 + 0.319z + 0.04}{0.5z^3 + 0.3z^2 + 0.17z - 0.2}$ Design and FIR digital filter to approximate an ideal low pass filter (c) 07 with pass band gain of unity, cut off frequency of 850Hz and working at sampling frequency of fs = 500Hz. The length of impulse response should be 5. Use rectangular window function OR Q.4 Explain Parallel realization of digital system giving suitable example. 03 (a) Obtain Direct form – II realization of following system **(b)** 04 $H(Z) = \frac{0.56z^{-1} + 0.638z^{-2} + 0.08z^{-3}}{1 + 0.6z^{-1} + 0.34z^{-2} - 0.4z^{-3}}$ Convert the analog filter with system function 07 (c) $H(s) = \frac{s+0.1}{(s+1)^2+9}$ into a digital IIR filter using bilinear transformation. The digital filter should have a resonant frequency of $\omega_r = \frac{\pi}{4}$ Differentiate Analog filter and Digital Filter **Q.5** (a) 03 Explain briefly analysis of Cardiac Variability in context on signal **(b)** 04 processing. Explain IIR filter design using Bilinear Z – Transform method. Also 07 (c) prove the transformation process stability. OR Q.5 Explain how Laplace transform and Z – transform are related by their (a) 03 poles plot diagram? Explain briefly the fundamentals approach for detection of QRS 04 **(b)** complex wave from ECG signal using signal processing. (c) Explain IIR filter design using (i) Approximation of derivatives and 07 (ii) Impulse Invariance method.
