

GUJARAT TECHNOLOGICAL UNIVERSITY
M. E. - SEMESTER – I • EXAMINATION – WINTER • 2014

Subject code: 710422**Date: 06-12-2014****Subject Name: Digital Signal Processing and Application****Time: 10:30 am - 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 (a)** Determine which of the following sinusoids are periodic and compute their fundamental period: (i) $\cos 3\pi n$ (ii) $\sin 3n$ (iii) $\sin(\pi n/4)$ **07**
- (b)** Determine if the systems described by following input-output relations are linear or non-linear (i) $y(n) = nx(n)$ (ii) $y(n) = x(n^2)$ (iii) $y(n) = x^2(n)$ **07**
- Q.2 (a)** Determine the impulse response of the cascade of two LTI systems having impulse responses $h_1(n) = (0.5)^n u(n)$ and $h_2(n) = (0.25)^n u(n)$ **07**
- (b)** Explain convolution theorem for Fourier transform with an example. **07**
- OR**
- (b)** Explain time shifting property of Fourier transform with an example. **07**
- Q.3 (a)** Determine the inverse z-transform of $X(z) = \log(1+az^{-1})$ where $|z| > |a|$ **07**
- (b)** Determine the z-transform of the signal $x(n) = \cos(\omega_0 n) u(n)$ **07**
- OR**
- Q.3 (a)** Explain properties of ROC of z-transform. **07**
- (b)** State and prove time reversal property of z-transform. **07**
- Q.4 (a)** Define discrete Fourier transform. Relate it with DTFT. **07**
- (b)** Compute DFT of the sequence $x(n) = \{0, 1, 2, 3\}$ **07**
- OR**
- Q.4 (a)** Define inverse discrete Fourier transform and give an example of computing the same. **07**
- (b)** With the help of an example, relate circular convolution with linear convolution. **07**
- Q.5 (a)** Give differences between FIR and IIR filters. **07**
- (b)** Explain Kaiser window based FIR filter design. **07**
- OR**
- Q.5 (a)** Compare DIT and DIF FFT algorithms. **07**
- (b)** Explain bilinear transformation method for IIR filter design. **07**
