

GUJARAT TECHNOLOGICAL UNIVERSITY
B.E. - SEMESTER – VIII EXAMINATION – OCTOBER 2012

Subject code: 182402

Date: 29/10/2012

Subject Name: Digital Signal Processing

Time: 02.30pm - 05.00pm

Total Marks: 70

Instructions:

1. Attempt any five questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Define 1) Signal 2) System. Classify them. 07
 (b) Explain the concept of pipelining in DSP. Also discuss the need of interlocking in brief. 07
- Q.2** (a) Check whether the following system functions are memory-less, stable, causal, linear and time-invariant or not. 07
 1. $y(t) = x(t^2)$ 2. $y(t) = \frac{dx(t)}{dt}$
 (b) State and prove the relationship between z-transform and discrete time Fourier transform. 07
OR
 (b) State and prove Parseval's relation for DTFT. 07
- Q.3** (a) Find the z transform of the causal signal $x(n) = a^n u(n)$ and depict the ROC and the locations of poles and zeros in the z-plane. 07
 (b) What is the importance of ROC in z transform? State the properties of z transform and ROC. 07
OR
- Q.3** (a) Determine the z-transform of 1) A unit impulse function $x(n) = \delta(n)$ 2) A unit step function $x(n) = u(n)$ and 3) $x(n) = u(-n)$. 07
 (b) Sketch the following signals. 1) $x_1(t) = \delta \cos(t)$ 2) $x_2(t) = \text{sgn}\left(\sin\left(\frac{\pi}{T}\right)t\right)$ 07
- Q.4** (a) Find the even and odd components of the signals. 07
 1) $x(t) = u(t) = 1, t > 0$
 $= 0, t < 0$
 2) $x(t) = Ae^{-\alpha t} = 1, t > 0$
 $= 0, t < 0$
 (b) Define the following terms: 07
 1) State space 2) Correlation 3) ROC 4) Sampling 5) Aliasing 6) Impulse Response 7) Convolution
OR
- Q.4** (a) Find the inverse z-transform of $x(z) = \frac{1}{\left(1 - \frac{1}{4}z^{-1}\right)\left(1 - \frac{1}{2}z^{-1}\right)}$ by partial fraction expansion method. 07
- Q.4** (b) Define periodicity. Check whether the following signals are periodic or not. If the signal is periodic, then specify its fundamental period. 07
 1. $x_1(t) = je^{j10t}$ 2. $x_2(t) = e^{(-1+j)t}$ 3. $x_3(n) = e^{j7\pi n}$
- Q.5** (a) Explain the structures for realization of FIR systems. 07
 (b) Describe the properties of Discrete Fourier Transform (DFT). 07
OR
- Q.5** (a) Explain the structures for realization of IIR systems. 07
 (b) Explain Radix-2 FFT and DIT algorithm. 07
