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

Subject code: 182402 **Subject Name: Digital Signal Processing** Time: 02.30pm - 05.00pm

Date: 29/10/2012

Total Marks: 70

07

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Instructions:

- 1. Attempt any five questions.
- 2. Make suitable assumptions wherever necessary.
- 3. Figures to the right indicate full marks.
- (a) Define 1) Signal 2) System. Classify them. 0.1
 - (b) Explain the concept of pipelining in DSP. Also discuss the need of interlocking 07 in brief.
- **O.2** (a) Check whether the following system functions are memory-less, stable, causal, 07 linear and time-invariant or not.

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 07 transform. OR 07
- State and prove Parseval's relation for DTFT. **(b)**
- (a) Find the z transform of the causal signal $x(n) = a^n u(n)$ and depict the ROC and 07 0.3 the locations of poles and zeros in the z-plane.
 - (b) What is the importance of ROC in z transform? State the properties of z 07 transform and ROC. OR
- (a) Determine the z-transform of 1) A unit impulse function $x(n) = \delta(n)$ 2) A unit 07 Q.3 step function x(n) = u(n) and 3) x(n) = u(-n).
 - (b) Sketch the following signals. 1) $x_1(t) = \delta \cos(t) 2) x_2(t) = \operatorname{sgn}\left(\operatorname{sin}\left(\frac{n}{T}\right)t\right)$ 07
- Find the even and odd components of the signals. 0.4 (a)

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

(a) Find the inverse z-transform of $x(z) = \frac{1}{(1-\frac{1}{2}z^{-1})(1-\frac{1}{2}z^{-1})}$ by partial fraction **Q.4** 07

expansion method.

Define periodicity. Check whether the following signals are periodic or not. If 07 0.4 **(b)** the signal is periodic, then specify it's fundamental period.

1.
$$x_1(t) = je^{j(0t)} 2$$
. $x_2(t) = e^{(-1+j)t} 3$. $x_3(n) = e^{j/nt}$

0.5 Explain the structures for realization of FIR systems. (a) 07 Describe the properties of Discrete Fourier Transform (DFT). **(b)** 07

OR

(a) Explain the structures for realization of IIR systems. 0.5 07 (b) Explain Radix-2 FFT and DIT algorithm. 07
