

GUJARAT TECHNOLOGICAL UNIVERSITY**M. E. - SEMESTER – I • EXAMINATION – SUMMER • 2014****Subject code: 2715203****Date: 21-06-2014****Subject Name: Digital Signal Processing****Time: 02:30 pm - 05:00 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) State and Prove Sampling Theorem. Explain aliasing effects. **07**
 (b) Find the convolution between the sequences $u(n)$ & $a^n \cdot u(n)$ **07**
- Q.2** (a) Find the Z Transform of $x(n) = A \sin(\omega_0 n)$ **07**
 (b) Find the DFT of the following sequence: **07**
 $x(n) = 1$ for $0 \leq n \leq 6$
 0 for $n > 6$
- OR**
- (b) Explain Decimation-in-Time based FFT algorithm and draw signal-flow graph for 8-point FFT implementation. **07**
- Q.3** (a) Explain the following properties of discrete time systems: **07**
 (1) Linearity (2) Time Invariance (3) Causality (4) Stability
 (b) Prove that the poles of a stable discrete time system must be within unit circle. **07**
- OR**
- Q.3** (a) Find the Impulse Response, Transfer Function $H(\omega)$ and System Function $H(z)$ for the Discrete Time System given by $y(n) = 0.2x(n) + 0.985y(n-1)$ **07**
 (b) Find the phase response of a system having symmetrical impulse response given by $h(n) = h(N-1-n)$. Plot the same in the range $0 \leq \omega < \pi$ **07**
- Q.4** (a) Design a 4th order Analog Butterworth Low Pass filter with 2000 Hz as the cut-off frequency and obtain $H(s)$. **07**
 (b) Obtain the expressions for the order and cut-off frequency of an analog Butterworth type low pass system from the specifications of the LPF system. **07**
- OR**
- Q.4** (a) What are the advantages of FIR system over IIR System? Explain in detail. **07**
 (b) Write short notes on (i) Analog to Digital Converter and (ii) Digital to Analog Converter and their significance. **07**
- Q.5** (a) Explain in detail about the analog low pass filter to analog high pass filter transformation. **07**
 (b) Provide detailed description about Impulse Invariant Transformation. **07**
- OR**
- Q.5** (a) Explain in detail Digital Sine-Cosine Generator **07**
 (b) Explain in detail about the Bilinear Transformation and the relation between Ω and ω in Bilinear Transformation. **07**
