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Roll No .....

EC-603 (GS)

B.E. VI Semester

Examination, May 2018

Grading System (GS)

Digital Signal Processing

Time : Three Hours

Maximum Marks : 70

Note: i) Attempt any five questions.
ii) All questions carry equal marks.

1. a) Determine if the system described by the following equations are causal or noncausal and stable or nonstable. 7

   i) $y(n)=x(n)+\frac{1}{x(n-1)}$

   ii) $y(n) = x(n^2)$

   b) Find $y(n)$ if $x(n) = n+2$ for $0 \le n \le 3$ $h(n) = a^n u(n)$ for all n. 7

2. a) Determine the homogeneous solution of the system described by the first order difference equation $y(n) + 3y(n-1) = x(n)$, with initial condition $y(-1) = 1$. 7

   b) Find the impulse response of the causal system $y(n) = x(n) + a\ y(n-1)$ where $a<1$ and compute the frequency response. 7

3. a) Determine the Z-transfer and Roe of the signal

   $x(n)=\left(\frac{1}{4}\right)^n u(n)$ 7

   b) Draw and explain the basic butterfly diagram or flowgraph of DIT radix-2 FFT. 7

4. a) Compute the N-point DFT of the following finite length sequence given as
   $x(n) = e^{-n}\ 0 \le n \le 4$ 7

   b) Compute the DFT of sequence defined by $x(n) = (-1)^n$ for $N = 4$. 7

5. a) State the computations complexity involved in direct computation of DFT. rgpvonline.com 7

   b) Draw the signal flow graph of DIF algorithm for N=16. Compute the DFT of the following equation
   $x(n) = \{1, 1, -1, -1\}$. 7

6. a) Determine H(z) using impulse invariance method

   $$Ha(s)=\frac{2}{(s+1)(s+2)}$$ 7

   b) Explain options method of FIR filter design. 7

7. a) Design a digital LPF (Butterworth) using bilinear transformation to meet the following specification.
   $F_p = 1.25$ kHz
   $F_s = 2.75$ kHz
   $r_p \le 0.5$ dB
   $r_s \ge 15$ dB
   sampling frequency = 10 kHz 7

   b) Make comparison between different methods of IIR filter design. 7

8. Write short notes on any two of the following: 14
   a) FFT algorithm
   b) Windowing technique
   c) Frequency domain representation of signal and systems

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