Reg. No. : .....

Name : .....

Sixth Semester B.Tech. Degree Examination, May 2013

(2008 Scheme)

Branch : Computer Science and Engineering

08.604 : DIGITAL SIGNAL PROCESSING

Time : 3 Hours Max. Marks : 100

PART – A

Answer **all** questions. **Each** question carries **4** marks.

1. Define and sketch four standard elementary discrete time sequences.
2. Determine whether the signal $x(t) = \cos^2(2\pi t)$ is periodic, if so, determine the period.
3. What is impulse response ? Explain its significance.
4. Sketch the following sequences :
   i) $x(n) = 3\delta(n+2) - 0.5\delta(n) + 5\delta(n-1) - 4\delta(n-5)$
   ii) $x(n) = \delta(n+1) - 2\delta(n-1) + 5u(n-4)$
5. State the differentiation property of the Z-transform.
6. Find the difference equation of a discrete LTI system whose transfer function is
   $H(z) = \dfrac{5z+2}{z^2+3z+2}$.
7. Define the DFT pair of a discrete time signal.
8. What are FIR and IIR systems ? Give examples.
9. Explain the cascade form realization of IIR system.
10. What is the advantage in linear phase realization of FIR system ?

PART – B

Answer **any one** question from **each** Module. **Each** question carries **20** marks.

MODULE – 1

11. a) Assuming a digital signal processing system with a sampling time interval of 0.01 second; convert the analog signal $x(t) = 5\sin(20\pi t)\, u(t)$ to the digital signal. Determine and plot the first five samples of the digital signal.

    b) Explain shifting and folding of discrete time signals.

    c) A discrete time signal $x(n) = \{0, \underset{\uparrow}{1}, 2, 3, 3\}$ is given. Sketch and label the following signals :

    i) x(n–2) ii) x(2n) and iii) x(–n).

12. a) Explain convolution sum.

    b) Find the convolution sum of two finite duration sequences x(n) = {3, 2, 1, 2} and h(n) = {1, 2, 1, 2} by a direct method.

    c) If the above is to be computed using Z-transform, describe the procedure that you will adapt (actual computation is not needed).

MODULE – 2

13. a) Define one sided and two sided Z-transform.

    b) Find the inverse Z-transform of the following :

    $X(z) = \dfrac{z}{3z^2 - 4z + 1}$; if ROC are

    i) $|z| > 1$, ii) $|z| < \dfrac{1}{3}$ and iii) $\dfrac{1}{3} < |z| < 1$.

    c) Using Z-transform method, determine the impulse response of the causal system.

    $y(n) = 3y(n-1) - 4y(n-2) = x(n) + 2x(n-1)$.

14. a) What is DIT radix-2 FFT ?

    b) Compute 8-point DFT of a sequence

    $x(n) = \{2, 2, 2, 2, 1, 1, 1, 1\}$ by radix-2 DIT-FFT.

MODULE – 3

15. a) Compare the direct form – I and II structures of IIR systems with 'M' zeros and 'N' poles.

    b) Realize the direct form – I and II structures of IIR system represented by the transfer function $H(z) = \dfrac{3(2z^2 + 5z + 4)}{(2z + 1)(z + 2)}$.

16. a) Explain the different structures used for FIR filters.

    b) Realize the following FIR system with minimum number of multipliers.

    i) $H(z) = \dfrac{1}{2} + \dfrac{1}{3}z^{-1} + z^{-2} + \dfrac{1}{4}z^{-3} + z^{-4} + \dfrac{1}{3}z^{-5} + \dfrac{1}{2}z^{-6}$

    ii) $H(z) = \left(\dfrac{1}{2} + z^{-1} + \dfrac{1}{2}z^{-2}\right)\left(1 + \dfrac{1}{3}z^{-1} + z^{-2}\right)$.
