Code No. : 5284

FACULTY OF INFORMATICS
B.E. 3/4 (IT) (I Semester) (Main) Examination, December 2011
DIGITAL SIGNAL PROCESSING

Time : 3 Hours] [Max. Marks : 75

Note : *Answer **all** questions from Part **A**.*
*Answer **any five** questions from Part **B**.*

PART – A **(25 Marks)**

1. Give the impulse response of a LTI system. **2**
2. Check the signal $x(n) = \sin(n\pi/2)$ for energy, power. **3**
3. Write the computation steps of IDFT through FFT and derive the formula. **3**
4. Find the circular convolution of $x_1(n) = \{1, 2, 2, 1\}$ and $x_2(n) = \{0, 1, 2, 3\}$. Using matrix method. **2**
5. Define and explain frequency wrapping. **3**
6. Find H(z) using bilinear transform for a system whose $H(S) = \frac{1}{4S+3}$ with T = 1sec. **2**
7. Explain Gibb's phenomenon. **2**
8. Distinguish between FIR and IIR filters. **3**
9. Give a model of speech production. **2**
10. Explain short time spectrum analysis briefly. **3**

PART – B **(50 Marks)**

11. a) Find the impulse response, magnitude and phase response of the given second order system. **6**

$$y(n) - y(n-1) + \frac{3}{16}y(n-2) = x(n) - \frac{1}{2}x(n-1)$$

b) Check whether the following systems are causal, linear **4**

i) $T[x(n)] = x(n - n_o)$ ii) $T[x(n)] = e^{x(n)}$

12. a) Outline steps in implementing DIF FFT algorithm for an N-point sequence. 4

    b) Compute the FFT of $x(n) = \{1, 2, 3, 4, 4, 3, 2, 1\}$ using DIT FFT algorithm. 6

13. Design a digital butterworth lowpass filter using bilinear transformation for the following specification. Assume suitable value of T. 10

    pass-band attenuation $= -3$ dB , $0 \le \omega \le 0.2\pi$

    stop-band attenuation $= -15$ dB , $0.3\pi \le \omega \le \pi$

14. a) Why do we use windows in FIR filter design. 3

    b) Design an ideal HPF filter with

$$H(e^{j\omega}) = \begin{cases} 1 & -\pi \le \omega \le -3\pi/4 \text{ and } 3\pi/4 \le \omega \le \pi \\ 0 & \text{Elsewhere} \end{cases}$$

    Find h(n) for N = 7 using rectangular window. 7

15. a) Explain briefly speech analysis and synthesis. 5

    b) What are the methods of exciation sources for pitch detection. Explain. 5

16. a) Explain the advantages of using FFT for computing DFT. Compare the number of multiplications and additions for N = 256 and N = 512. 5

    b) Prove the properties of time convolution and frequency convolution of DFT. 5

17. a) Explain the method of designing FIR filters using Fourier series method. 5

    b) Find the Fourier transform of $x(n) = \left(\frac{1}{4}\right)^n u(n+4)$. 5