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Reg. No. : ....

Name : ....

Fifth Semester B.Tech. Degree Examination, November 2012
(2008 Scheme)
08.502 : DIGITAL SIGNAL PROCESSING (TA)

Time : 3 Hours Max. Marks : 100

PART – A

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

M1 1. $x(n) = 4 + \cos^2 \frac{2\pi n}{N} : 0 \le n \le N-1$; find N point DFT.

M1 2. Given that x (n) = (1, 0, 1, 0). Find y (n) if its 4 point DFT $y(k) = x((k-2))_4$.

3. A continuous time signal $x(t) = 3\cos(400\pi t) + 5\sin(1200\pi t) + 6\cos(4400\pi t) + 2\sin(5200\pi t)$ is sampled at 4 kHz rate generating the sequence x (n).

   Determine the exact expression of x (n).

M1 4. The 4 point DFT of a real sequence x (n) is x (k) = (1, j, 1, –j). Using the properties of DFT, find the DFT of $(-1)^n x(n)$.

5. Mention two properties each of Butterworth and Chebyshev filters.

6. Obtain the cascade realization with minimum number of multipliers for the system function :

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

M4 7. Given pass band and stop band frequencies, pass band and stop band attenuations. Mention the steps to design analog Butterworth filter.

M6 8. Compare fixed and floating point arithmetic methods.

M6 9. Illustrate truncation and rounding with a suitable example.

M6 10. Why anti aliasing filter is required to prior to down sampling ? **(4×10=40 Marks)**

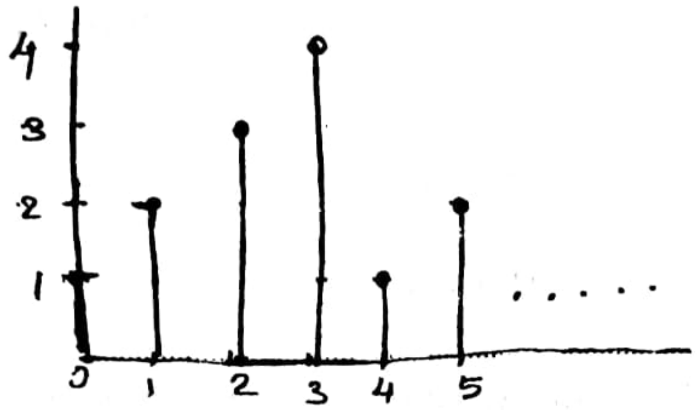
P.T.O.

PART – B

Answer **any two** questions from **each** Module.

Module – I

11. Consider the sequence shown below. **10**



Assume fs = 100 Hz and take N = 4.

Compute amplitude, phase and power spectra in frequency domain.

12. a) Let g (n) and h (n) are two finite length sequences of length 5 each. If y_e (n) and y_c (n) denote the linear and circular convolution of g (n) and h (n) respectively, express y_c (n) in terms of y_e (n). **5**

m1

b) Given x (n) = $(\underset{\uparrow}{2}, 1, 0, 1)$. If we compute a five point IDFT of y (k) = x^2 (k) to obtain a sequence y (n), determine y (n) for n = 0, 1, 2, 3, 4. **5**

m1

13. a) 4 point DFT of a sequence x (n) is (2, 0, 2, 0). By using butterfly diagram as in DITFFT, find x (n). **5**

m2

b) Using decimation in frequency algorithm, compute 4 point DFT of the sequence x (n) = (0, 1, 2, 3). **5**

m2

Module – II

14. Sketch the block diagram for frequency sampling realization of the $N = 32, \alpha = 0$ linear phase (symmetric) FIR filters which has the samples **10**

M3

$$H\left(\frac{2\pi k}{32}\right) = 1 \;;\; k = 0, 1, 2$$
$$= \frac{1}{2} \;;\; k = 3$$
$$= 0 \;;\; k = 4, 5, 6.....15$$

15. Design an ideal HPF with a frequency response

M3

$$H_d(e^{jw}) = 1;\ \pi/4 \leq |w| \leq \pi$$
$$= 0 \;;\; |w| < \pi/4$$

$N = 11$, Use Hamming Window.

From the transfer function of the filter, obtain its realizable transfer function. **10**

16. Using bilinear transformation, design a high pass filter monotonic in pass band with cut off frequency 1000 Hz and down 10 dB at 350 Hz. Sampling frequency is 5000 Hz. **10**

M4

Module – III

17. a) Explain limit cycle oscillations with an example. **5**

M6

b) Explain the characteristics of a limit cycle oscillation with respect to the system described by $y(n) = 0.95\, y(n-1) + x(n)$.

Determine the dead band of the filter. **5**

18. Derive frequency domain representations of up sampled and down sampled signals in multirate signal processing. **10**

M6

19. Explain the following :

a) Sub band coding. **5**

b) Architecture of TMS 320 C 6713 processor. **5**

M5

(10x6=60 Marks)