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Reg. No. : .....

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Seventh Semester B.Tech. Degree Examination, May 2014
(2008 Scheme)
08.703 : DIGITAL SIGNAL PROCESSING (E)

Time: 3 Hours Max. Marks: 100

PART – A

Answer **all** questions from Part – **A** :

1. State the advantages and limitations of DSP.
2. The impulse response of a discrete LTI system is given by $h(n) = \left(\frac{1}{2}\right)^n \cdot u(n) + \left(-\frac{1}{2}\right)^n \cdot u(n)$. Is the system stable ?
3. Check whether the signal, $x(n) = \cos\left(\frac{\pi}{3}\right)^n + \cos\left(\frac{3\pi}{4}\right)^n$ is periodic or not. If periodic, what is the fundamental period ?
4. Sketch the line spectrum of the signal, $x(t) = 3 - 5\cos(40\pi t - 30°) + 4\sin 120\pi t$.
5. Obtain the output of the discrete LTI system when $x(n) = \left\{1, \underset{\uparrow}{4}, 3, 2\right\}$ and $h(n) = \left\{\underset{\uparrow}{1}, 3, 2, 1\right\}$. Use Z-Transform method.
6. Clearly explain the significance of ROC in Z-Transforms.
7. Distinguish between DFT and FFT.
8. How are IIR filters different from FIR filters ?

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9. Explain how the characteristics of practical filters different from ideal ones.

10. What is bilinear transformation ?

PART – B

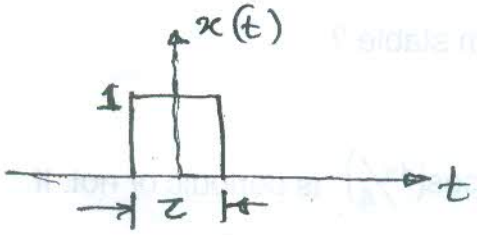
Answer **one full** question from **each** Module :

Module – 1

11. a) With the help of a block diagram, explain how a Digital Signal Processing System works. 7

b) For the given sequence, $x(n) = \left\{ \underset{\uparrow}{0}, 1, 2, 3, 4, 5, 6 \right\}$ draw $x(-n + 2)$. 5

c) Obtain the Fourier Transform of the gate function shown in Fig.



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12. a) Check the following systems for linearity :

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

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

iii) $y(n) = n \cdot x(n)$

iv) $y(n) = \cos x(n)$. 10

b) Find out whether the following systems are time invariant or not.

i) $y(n) = 4n \cdot x(n)$

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

iii) $y(n) = x(-n)$

iv) $y(n) = x(n) \cdot x(n - 1)$. 10

Module – 2

13. a) Obtain the Z-Transform including ROC of the sequence,

$$x(n) = \left(\frac{1}{5}\right)u(n) + 5\left(\frac{1}{2}\right)^{-n} \cdot u(-n-1).$$ 10

b) Find the 8-point DFT of the sequence using radix 2, decimation in Time FFT algorithm.
$x(n) = \{1, 1, 1, 1, 1, 1, 0, 0\}$. 10

14. a) Determine the inverse Z-Transform of $X(z) = \frac{1}{1 - 1.5z^{-1} + 0.5z^{-2}}$ if

i) ROC : $|z| > 1$

ii) ROC : $|z| < 0.5$

iii) ROC : $0.5 < |z| < 1$. 10

b) Obtain the 8-point DFT of the sequence using Decimation in Frequency Radix 2 FFT algorithm.
$x(n) = \{2, 2, 2, 2, 1, 1, 1, 1\}$. 10

Module – 3

15. a) Obtain the direct form I and direct form II realisations of the system,

$$H(z) = \frac{\left(1 + \frac{1}{5}z^{-1}\right)}{\left(1 - \frac{1}{2}z^{-1} + \frac{1}{3}z^{-2}\right)\left(1 + \frac{1}{4}z^{-1}\right)}.$$ 8

b) Design a low pass FIR filter with cut off frequency of 1 kHz and sampling frequency of 4 kHz with 11 samples using Fourier series method. 12

16. a) Obtain the parallel form realisation of the system,

$$H(z) = \frac{1 + 2z^{-1} + z^{-2}}{1 - 0.75z^{-1} + 0.125z^{-2}}.$$ 8

b) For the analog transfer function, $H(s) = \frac{2}{s^2 + 3s + 2}$, determine H(z) using impulse invariance transformation if

a) T = 1 sec and b) T = 0.1 sec. 12