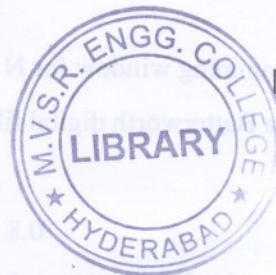# FACULTY OF ENGINEERING

B.E. III/IV (ECE) II Semester (Main) Examination, May/June, 2011

DIGITAL SIGNAL PROCESSING

Time : 3 Hours] [*Max. Marks* : 75

Answer all questions from Part A.
Answer **five** *questions from Part B.*

Part A – (25 marks)

1. Explain any three properties of convolution sum. 2

2. Determine whether the following system is time-invariant or not. y (n) = sin [x (n)]. 2

3. Differentiate Linear Convolution and Circular Convolution. 3

4. Draw the basic butterfly structure for radix-2 DIT FFT algorithm. 2

5. What are the conditions for a FIR system to have linear phase? 3

6. Explain Gibb's phenomenon. 2

7. Determine the order of the LPF if it has pass band attenuation of 3dB at 500 Hz and stop band attenuation of 40 dB at 1000 H$_z$. 3

8. What are finite word-length effects? 3

9. Compare the architectures of conventional μp and DSP processor. 2

10. Explain any two data transfer instructions of TMS 320 C54xx. 3

Part B (50 Marks)

11. (a) Test whether the following systems are stable or not :

    (i) h (n) = e^{an} . u(n)   (ii) h (n) = a . e$^{-b|n|}$ 4

    (b) The impulse response of an LTI system is h (n) = $\left(\dfrac{1}{3}\right)^n$. u (n). Determine output of the system for a unit step input signal. 6

12. (a) Determine 4-point DFT of the following signal

    x (n) = 1, 0 ≤ n ≤ 3

          = 0, elsewhere. 5

    (b) Compare overlap – add & overlap - save methods. 5

13. Determine IFFT using Decimation Time method for X (k) = {4, –6, 8, –10, 12, –3, 2, –1}. 10

14. Design an ideal LPF whose desired frequency response is

$$H_d\left(e^{jw}\right) = 1, \frac{\pi}{3} \geq \omega \geq -\frac{\pi}{3}$$

$$= 0, \pi \geq |\omega| \geq \frac{-\pi}{3}$$

using Hamming window for N = 9.　　　　　　　　　　　　　　　　　　　10

15. Design a Butterworth digital filter (HPF) with following specifications :

$$|H\left(e^{jw}\right)| \leq 0.2, \quad 0 \leq w \leq 0.2\,\pi$$

$$0.8 \leq |H\left(e^{jw}\right)| \leq 1, \quad 0.6\pi \leq w \leq \pi$$

using Impulse Invariant transformation.　　　　　　　　　　　　　　10

16. (a) Compare fixed-point & floating-point representations.　　　　　6

　　(b) Explain any four important applications of DSP processors.　　　4

17. Write short notes on :

　　(a) Properties of Twiddle factor.　　　　　　　　　　　　　　　3

　　(b) Advantages of Digital filters.　　　　　　　　　　　　　　4

　　(c) Applications of Digital Signal Processing.　　　　　　　　　3