

## FACULTY OF ENGINEERING

## B.E. III/IV (E &amp; EE/Inst.) II Semester (Main) Examination, May/June 2011

## DIGITAL SIGNAL PROCESSING

Time : 3 Hours]

[Max. Marks : 75

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

## Part A – (Marks : 25)

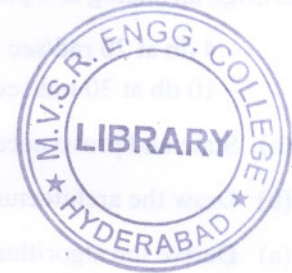
1. Let  $e(n)$  be an exponential sequence i.e.  $e(n) = \alpha^n$ .  
and let  $x(n)$  and  $y(n)$  denote two arbitrary sequences. Show that  

$$[e(n) x(n)] * (e(n) y(n)) = e(n) [x(n) * y(n)]$$
[\* represents convolution] 3
2.  $x(n) = 17 \cos(20\pi n + 30^\circ)$ . Find (a) Period of  $x(n)$  (b) minimum sampling frequency required to avoid aliasing. 2
3. Distinguish between DFT and DTFT. 2
4.  $x(n) = \{1, 2, 3, 4\}$   $y(n) = \{1, 1, 1, 1\}$ . Find linear convolution of the two signals using circular convolution. 3
5.  $H(z) = \frac{2 \cdot Z}{3(Z-1)} + \frac{2}{3(Z-2)} + \frac{2}{2-3}$ . ROC  $1 < |z| < 2$ . Find inverse z transform. 3
6. Define stability in Z-plane. 2
7. What is the principle behind bilinear transformation? 2
8.  $H_a(s) = \frac{1}{S(S+1)}$ , find  $H(z)$  using impulse invariant method. 3
9. What is 'pipelining' in Digital signal processor? 3
10. Write the advantages of FIR filters. 2

## Part B – (Marks : 50)

11. (a) Find the step response of the following system  $y(n) = 0.6 y(n-1) - 0.08 y(n-2) + x(n)$ . 5
- (b) Find the frequency response of the following system : 5

$$Y(n) = 0.5 x(n) + x(n-1) + 0.5 x(n-2).$$



12. (a) State and prove symmetry properties of DFT. 5
- (b) Determine the DFT of the following signal by using Radix 2 DIF FFT 5  
 $x(n) = \{1, 2, 3, 2, 1, 2, 3, 2\}$
13. Obtain direct form 11 and parallel form realizations for the following system : 10
- $$H(z) = \frac{(1+z^{-1})(1+3z^{-1})}{(1+0.5z^{-1})(1-0.25z^{-1})(1+0.125z^{-1})}$$
14. Design an analog low pass Butterworth filter with the following specification : 10
- 4 db at 20 rad/sec
  - 10 db at 30 rad/sec.
15. (a) State and prove necessary and sufficient condition for a FIR filter to have linear phase. 5
- (b) Draw the architecture of 7mS320CS  $\times$  DSP. 5
16. (a) Derive the algorithm for Radix 2 DIT FFT. 7
- (b) Write the steps to design FIR filter. 3
17. Write short notes on : 5
- (a) Sampling, quatizing and encoding. 5
  - (b) Periodic convolution. 5