Code No.: 3069

## FACULTY OF ENGINEERING

### B.E. III/IV (E & 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) = $\alpha^n$. 3
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]
2. x (n) = 17 cos (20πn + 30°). Find (a) Period of x(n) (b) minimum samplimg frequency requried to avoid aliasing.
2
3. Distinguish between DFT and DTFT. 2
4. x (n) = {1, 2, 3, 4} y (n) = {1, 1, 1,}. Find linear convolution of the two signals using circular convolution. 3
5. $H(z) = \frac{2 . Z}{3(Z - 1)} + \frac{2}{3(Z - 2)} + \frac{2}{2 - 3}$ . 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. Ha(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).

[P.T.O.

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

$$H(z) = \frac{(1 + z^{-1})(1 + 3z^{-1})}{(1 + 0.5\, z^{-1})(1 - 0.25 z^{-1})(1 + 0.125\, z^{-1})}$$

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 × 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 :

(a) Sampling, quatizing and encoding. 5

(b) Periodic convolution. 5