FACULTY OF ENGINEERING

B.E. 4/4 (ECE) I – Semester (Main) Examination, December 2010

Subject : Multi Rate Signal Processing (Elective – I)

Time : 3 Hours
Max.Marks: 75

Note: Answer all questions. All questions carry equal mark

PART – A (25 Marks)

1. Compare the characteristics of different windows (any three).

2. Let H(z) = $\dfrac{3z^2 + 5z + 1}{z^2 + 5z + 3}$. It is a

   (a) LPF   (b) HPF   (c) All pass   (d) None

3. Is multi rate system a LTI system or not. Justify.

4. What are ghosts in up sampling? How do you remove them?

5. Explain why re-sampling filters are used.

6. Draw the characteristics of a Nyquist filter.

7. Draw the characteristics of a half band filter.

8. Draw the realization diagram of a recursive all pass filter.

9. Why timing recovery is important in demodulators.

10. What are advantages of multiple stage filter structures?

PART – B (50 Marks)

11.(a) Compare Impulse invariant and Bilinear transformation methods.
   (b) Convert the analog filter H(s) to digital domain using Impulse invariance method.

$$H(s) = \frac{S+3}{S^2 + 4S + 4}$$

12. Design a FIR equiripple filter of length 3 to have pass band cut off frequency at 500 Hz and a stop band cut off frequency at 200 Hz. The tolerances in pass band and stop band are in the ratio 1:2.

13.(a) Draw the two channel QMF filter bank and explain.
   (b) Design a linear phase FIR low pass filter to meet the following specifications.

Pass band	:	0 to 200 Hz
Stop band	:	220 to 5000 Hz
Pass band ripple	:	0.02
Stop band ripple	:	0.04

Choose suitable sampling frequency.

14.(a) State and prove noble identities.
   (b) Discuss the applications of square root Nyquist filter.

15.(a) With a mat diagram explain recursive polyphase filters.
   (b) Draw the polyphase diagram for a decimation of 10.

16.(a) What are Comb filters.
   (b) Discuss the applications of Comb filters.

17. Write short notes on any two.
   a) Hilbert transform