B.E. Sem 7 (Rev.) Etrx. Filter Theory and Applications 21/5/08

Con. 2948-08. CO-3376

(REVISED COURSE)

(3 Hours) **[Total Marks : 100**

N.B. (1) Question No. **1** is **compulsory.**
(2) Attempt any **four** questions out of the remaining **six** questions.
(3) Assume any **suitable** data wherever **necessary.**

1. (a) Convert $H_a(s) = \frac{s+0\cdot1}{(s+0\cdot1)^2+16}$ into digital filter using impulse invariance method. **20**
   (b) Explain matched z-transform techniques.
   (c) Describe different window functions used in FIR filter design.
   (d) Compare Butterworth and Chebyshev filter.

2. (a) Design Low pass filter with following specifications. **15**

$$H_d(w) = e^{-j3w}, \quad \frac{-3\pi}{4} \le w \le \frac{3\pi}{4}$$

$$= 0, \quad \frac{3\pi}{4} < w < \pi .$$

   Use Hamming window with M = 7 to obtain H(w).
   (b) Give advantages and disadvantages of digital filters over analog filters. **5**

3. Design a digital Chebyshev filter to meet the following constraints. **20**

$$0\cdot9 \le |H(e^{jw})| \le 1, \quad 0 \le w \le 0\cdot25\,\pi$$
$$|H(e^{jw})| \le 0\cdot2, \quad 0\cdot6\,\pi \le w \le \pi.$$

   Use Billinear Transformation. Assume T = 1 sec.

4. (a) Convert $H(s) = \frac{2}{(s+1)(s^2+5s+6)}$ to H(z) using impulse invariance with T = 0·5 sec. **10**
   (b) Explain the design procedure of Bessel filters. **10**

5. (a) Design an Elliptic low pass filter to meet the following specifications, **12**
   A_p = 2 dB, A_s = 20 dB,
   w_p = 4 rad/sec, w_s = 8 rad/sec.
   (b) What is Warping effect ? How warping effect can be eliminated ? What is influence of warping effect on the phase response ? **8**

6. (a) Find cascade and parallel realisation of IIR digital function. **10**

$$H(z) = \frac{6z^2+15z+12}{2z^2+5z+2}.$$

   (b) What are the advantages of elliptic approximation over Chebyshev and inverse Chebyshev approximations ? **10**

7. Write a short notes on :— **20**
   (a) . Design steps of IIR filter using impulse invariance method
   (b) Digital filter Transformations
   (c) Comparison between IIR and FIR digital filters.
