

NB:

- 1) Question No. ONE is compulsory.
- 2) Out of remaining questions, attempt any THREE questions.
- 3) In all FOUR questions to be attempted.
- 4) All questions carry equal marks.
- 5) Answer to each new question to be started on a fresh page.
- 6) Figures in brackets on the right hand side indicate full marks.
- 7) Assume Suitable data if necessary

Q1. Attempt any four

(20 marks)

- a) Differentiate between Butterworth and Chebyshev filters.
- b) Explain frequency wrapping effect in designing IIR filter.
- c) State the relationship between DFS, DFT and Z transform.
- d) What is DTFS. Find DTFS of  $x(n) = \{0, 1, 2, 3\}$  with period  $N=4$ .
- e) Compare DSP processor and microprocessor.

Q2. a) Compute IDFT of the following sequence using inverse FFT algorithm  $X(k) = \{3, 0, 3, 0, 3, 0, 3, 0\}$ 

(10 marks)

b) Write down design steps for FIR filter using window techniques. Compare windows. (10 marks)

Q3. a) Design analog Butterworth filter that has -2 dB passband attenuation of 20 rad/sec and at least -10 dB stopband attenuation at 30 rad/sec. (10 marks)

b) Compute the circular convolution of the sequence using DFT and IDFT,  $x_1(n) = \{1, 2, 0\}$  and  $x_2(n) = \{2, 2, 1, 1\}$  (10 marks)Q4. a) Given  $H(s) = [1 / (s+1)(s+3)]$ ,  $T=2$  seconds. Design digital IIR filter using BLT method. Explain advantages of BLT over IIM method. (10 marks)b) Design 6<sup>th</sup> order linear phase LPF with cut off frequency  $\pi/2$  using Blackman window. (10 marks)

Q5. a) Design Butterworth LPF to meet following specifications

Passband gain is 0.89

Passband frequency edge 30Hz

Attenuation 0.20

Stopband edge 75Hz

(10 marks)

b) Design the symmetric FIR LPF where desired frequency response is given as

$$H_d(\omega) = \begin{cases} e^{-j\omega t} & \text{for } |\omega| \leq \omega_0 \\ 0 & \text{otherwise} \end{cases}$$

(10 marks)

Q6. Write short note on following (Any two)

(20 marks)

- a) Gibb's Phenomenon
- b) Application of DSP in speech and Radar processing
- c) Limit cycle Oscillations