T.E. (EXTC) (Sem-VI) (CBSGS) Date-5/12/19

(3 Hours) [Total Marks: 80]

N.B.: (1) **Questions No.1** is **compulsory**.
(2) Attempt **any three** questions out of remaining **five** questions.
(3) Assume suitable **data** if **required**.
(4) **Figures** to the **right** indicate **full marks**.

Q 1.Solve **any four** **20**

a) What method would you adopt to filter long data sequence? Explain any one method.
b) Given an analog filter, you are directed to design a digital IIR filter with the same specifications, list the steps you would follow. How would you go about the task and what desirable properties of the conversion techniques would you cite?
c) List the application of multirate signal processing. Explain the importance of multirate digital signal processing.
d) How does the position (within or outside of unit circle) of the zeros effect the phase of the system?
e) Retrieve the original sequence $x(n)$ from $X(k)$=[2, 1-j, 0, 1+j] using IDIF-FFT only.

Q2 a) Determine the N-point DFT, using DIT-FFT only, of the signal **10**

$$x(n) = 6\cos^2\left(\frac{n\pi}{4}\right) for\ 0 \le n \le 7$$

b) Design a High pass filter that is monotonic in pass-band with cut-off frequency of 1000 Hz and down 10 dB at 350 Hz, using Bilinear Transform, with f_s=5000 Hz. **10**

Q3 a) Compute the DFT of 2- 4 point sequences p(n)= [2 1 5 4] and q(n)=[4 6 3 2] using 4 point DFT only once. **10**
b) Explain with suitable examples how zeros are positioned under different symmetry conditions of a linear phase FIR filter. **10**

Q4 a) Design a Chebyshev filter for the given specifications using impulse invariance technique **10**

$$0.8 \le |H(e^{jw})| \le 1 \quad 0 \le \omega \le 0.2\pi$$
$$|H(e^{jw})| \le 0.2 \quad 0.6\pi \le \omega \le \pi$$

b) Design a high pass filter with frequency response using Hanning window of N=11. **10**

$$H_d(e^{jw}) = 1 \ for \ \frac{-\pi}{4} \le \omega \le \pi$$
$$= 0 \ for \quad |\omega| \le \frac{\pi}{4}$$

Q5 a) Find DFT of a 4-point sequence $x(n)$=[1, 2, 3, 4], then using properties of DFT find the DFT of $x_1(n)$=[1, 0, 2, 0, 3, 0, 4, 0] and $x_2(n)$= [1, 2, 3, 4, 1, 2, 3, 4] **10**
b) Explain the Finite length effects in Digital Filters. **10**

Q6 a) Explain DTMF application of digital signal processing. **10**
b) Explain sub-band coding of speech signal with neat illustration. **10**
