

M.Tech. Electronics & Communication Engineering (CBCS Pattern) Semester-I
PECS13 - Advanced Digital Signal Processing

P. Pages : 2

Time : Three Hours



GUG/W/24/10980

Max. Marks : 70

- Notes :
1. All questions carry equal marks.
 2. Attempt **any five** questions.
 3. Assume suitable data wherever necessary.
 4. Illustrate your answers wherever necessary with the help of neat sketches.

1. A) Compare the complex multiplication and addition in between DFT and FFT. 7
B) State and prove any two properties of Z-Transform. 7
2. A) Find the inverse Z-transform for $x(n) = \frac{1}{(Z+2)(Z+1)}$ 7
B) What is adaptive filter? With neat block diagram discuss any four applications of adaptive filter. 7
3. A) Design Butterworth filter using bilinear transformation method for the following specifications. 8
$$|H(e^{j\omega})| \leq 0.2; 0.6 \leq \omega \leq \pi(16)$$
$$0.8 \leq |H(e^{j\omega})| \leq 1; 0 \leq \omega \leq 0.2\pi$$

B) Perform the circular convolution of the following sequences using DFT and IDFT. 6
 $X_1(n) = \{1, 2, 1, 3\}$ and $X_2(n) = \{1, 1, 1, 1\}$
4. A) Compute 8 point DFT of the sequence $x(n) = (n + 1)$ using Radix-2 DIF FFT algorithm. 7
B) Design a FIR bandpass filter to pass frequencies in the range 1.5 kHz to 3 kHz and Sampling frequency of 8 kHz with 7 samples using Fourier series method. 7
5. A) Explain the design procedure for IIR filter Chebyshev and Butterworth approximations. 7
B) Explain what is decimation and how it is implemented? 7
6. A) States the features of TM5320C5X DSP processor. Explain pipeline and parallel processing in DSP processor. 7
B) Explain LMS algorithm with neat diagram and relevant equations. 7

7. A) What is multi rate signal processing? Discuss about the sampling rate conversion by factor of I/D. **7**
- B) Describe how to generate forecasts using an ARMA model and explain how the forecast variance changes over time. **7**
8. A) Explain in detail uniform DFT filter bank. **6**
- B) Define the following terms. **8**
- i) Forward prediction error.
- ii) Backward prediction error.
