## SEAT No. :

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## T.E. (Electronics & Telecommunication Engineering) DIGITAL SIGNAL PROCESSING (Elective - I) (2019 Pattern) (Semester - I) (304185)

Time : 2<sup>1</sup>/<sub>2</sub> Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Neat diagrams must be drawn wherever necessary.
- 2) Figures to the right indicate full marks.
- 3) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
- 4) Assume suitable data, if necessary.
- Q1) a) Compute DFT of  $x[n] = \{1,2,0,1\}$  using direct computation method and matrix method. [8]
  - b) Compute FFT of  $x[n] = \{1,1,0,0\}$  using decimation in time (DIT) FFT algorithm and decimation in frequency (DIF) FFT algorithm. [10]
- **Q2**) a) Compute circular convolution of  $x_1[n] = \{1,2,3,4\}$  and  $x_2[n] = \{1,2,3\}$  using graphical method and matrix method. [8]
  - b) Derive decimation in time FFT algorithm for 8 point DFT and explain how butterfly structure is used in FFT.
- Q3) a) Design analog Butterworth filter to have magnitude of 0.9 at 100 Hz and magnitude of 0.2 at 300 Hz.
  - b) Write transfer function of second order analog Butterworth low pass filter with cutoff frequency 0.8 rad/sec and convert it into digital Butterworth filter using bilinear transformation method with sampling period of 0.1 second.
  - c) Realize the following IIR filter using direct form I and direct form II

$$H(z) = \frac{1+2z^{-1}+3z^{-2}}{1+4z^{-1}+5z^{-2}+7z^{-3}}$$
[5]  
*P.T.O.*

X,

- OR
- Design digital Butterworth filter to meet the following specifications using **Q4**) a) bilinear transformations with sampling period of 0.5 seconds. [14]



- (Q7) a) Draw the diagram of human speech production system and explain the role of vocal cords, velum and vocal tract. [8]
  - b) What is artifact ? What are different artifacts in ECG? State their reasons and suggest methods to supress these artifacts. [9]

## OR

- (Q8) a) Draw the diagram of standard ECG signal and explain different waves and segments in ECG signal with reference to heart activity. [8]
  - b) Explain ZCR and autocorrelation methods for pitch detection of speech signal. [9]

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