

Code No: **RT42023B****R13****Set No. 1****IV B.Tech II Semester Regular/Supplementary Examinations, April/May - 2019****DIGITAL SIGNAL PROCESSING****(Electrical and Electronics Engineering)****Time: 3 hours****Max. Marks: 70****Question paper consists of Part-A and Part-B****Answer ALL sub questions from Part-A****Answer any THREE questions from Part-B****\*\*\*\*\*****PART-A (22 Marks)**

1. a) What are the basic elements of Digital Signal Processing? Explain. [4]
- b) Give the Relation between Z-transform and DFS. [3]
- c) What are the applications of FFT algorithm? [4]
- d) Give the equations specifying the following windows. (a) Rectangular window [4]  
(b) Hamming window
- e) What is decimation by factor D? Explain with an example. [3]
- f) What are the flags in the status registers? [4]

**PART-B (3x16 = 48 Marks)**

2. a) Check whether the following systems are whether linear, Stable and Invariant or not. [8]  
(i)  $y(n)=x^2(n)$  (ii)  $y(n)=n x(n)+x^2(n-2)$
- b) Determine the response of Second order Discrete Time system governed by the difference equation  $y(n)-2y(n-1)-3y(n-2)=x(n)+4x(n-1)$ ,  $n \geq 0$ , When the input signal is  $x(n)=2^n u(n)$ , and with initial conditions  $y(-2)=0, y(-1)=5$ . [8]
3. a) Prove the following properties related to DFT. [8]  
(i) Complex conjugate (ii) Circular correlation
- b) Consider a sequence  $x(n) = \{2, -1, 1, 1\}$  and  $T = 0.5$  compute its DFT and compare it with its DTFT. [8]
4. a) Compute the 8-point DFT of the sequence  $x(n) = 1, 0 \leq n \leq 7$  [8]  
0, otherwise  
by using DIF algorithm.
- b) What are the differences and similarities between DIT and DIF FFT algorithms? [8]
5. a) Explain the design of FIR filters using windows. [8]
- b) Design a Butterworth high pass filter satisfying the following specifications. [8]  
 $\alpha_p = 1 \text{ dB}; \alpha_s = 15 \text{ dB}$   
 $\Omega_p = 0.4\pi; \Omega_s = 0.2\pi$
6. a) What is the significance of multi rate signal processing and its applications? [8]
- b) With necessary derivations explain the operation of sampling rate conversion by a factor of I in both frequency and time domains. [8]
7. a) Draw and explain the architecture of TMS 320C5x processor. [8]
- b) Explain the following terms in Pipelining: (i) Interlocking. (ii) Branching effect. [8]