*R18 Regulation* *Subject code: 2P5DC*

# TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

## B.Tech V Semester Supplementary Examinations, July 2024

## DIGITAL SIGNAL PROCESSING
## (ECE)

***Maximum Marks: 70*** Date:24.07.2024 Duration: 3 hours

Note: 1.This question paper contains two parts A and B.
2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit which carries 10M.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

| All the following questions carry equal marks (10X2M=20 Marks) | | CO | Bloom Tx |
|---|---|---|---|
| 1 | What is meant by zero state response of a system. | 1 | L1 |
| 2 | Determine z-transform of the finite duration signal x(n)={2,4,7,0,1} | 1 | L1 |
| 3 | What is meant by zero padding? | 2 | L1 |
| 4 | Draw the basic butterfly diagram of DIT algorithm | 2 | L1 |
| 5 | What is the effect of varying order of Butterworth filter (N) on magnitude and phase response | 3 | L1 |
| 6 | Mention the procedures for digitizing the transfer function of an analog filter | 3 | L1 |
| 7 | List the properties of FIR filter | 4 | L1 |
| 8 | What are the methods used for designing of FIR filters | 4 | L1 |
| 9 | Define interpolation process. | 5 | L1 |
| 10 | What are the methods used to prevent overflow | 5 | L1 |

Part-B

| Answer All the following questions. (5X10M=50Marks) | | | |
|---|---|---|---|
| 11 | A causal LTI system is described by the difference equation y(n)=y(n-1)+y(n-2)+x(n-1).where x(n) is input and y(n) is output.<br>Find: i)The system function H(z).Plot the poles and zeros of H(z) and indicate the ROC.<br>ii)Find the unit sample response of the system.<br>iii)Is the system stable or not? (10M) | 1 | L2 |
| | OR | | |
| 12 | a) Write a short note on realization of digital filters (5M)<br>b) An LTI system is described by the equation y(n) = x(n)+0.8x(n-1)+0.7x(n-2)- 0.45y(n-2). Determine the transfer function of the system. Sketch its poles and zeros on the Z-plane. (5M) | 1 | L2 |
| 13 | a) Compare the computational complexity of FFT and DFT (5M)<br>b) Distinguish between overlap-save and overlap-add methods. (5M) | 2 | L2 |

| | | | |
|---|---|---|---|
| | OR | | |
| 14 | Implement the Decimation in frequency FFT algorithm for $x(n) = (-1)^n$ for N=8 using the signal flow graph. Show all the intermediate results on the signal flow graph. (10M) | 2 | L2 |
| 15 | a) For the given specifications design an analog Butterworth low pass filter<br>$0.9 \leq \lvert H(j\Omega) \rvert \leq 1$ for $0 \leq \Omega \leq 0.2\pi$<br>$\lvert H(j\Omega) \rvert \leq 0.2$ for $0.4\pi \leq \Omega \leq \pi$ (7M)<br>b) Specify various types of filters available based on frequency selection.(3M) | 3 | L2 |
| | OR | | |
| 16 | Discuss in detail about design of IIR filter using Bilinear transformation. (10M) | 3 | L2 |
| 17 | Design an ideal low pass filter whose frequency response<br>$H_d(e^{j\omega}) = 1$ for $-\pi/2 \leq \omega \leq \pi/2$<br>$= 0$ for $\pi/2 \leq \omega \leq \pi$ .<br>Find the values of h(n) for N=11. Find H(z). (10M) | 4 | L2 |
| | OR | | |
| 18 | a) List the advantages and disadvantages of FIR filter over IIR filter. (4M)<br>b) Explain the Design of FIR digital filter by using fourier series method.(6M) | 4 | L2 |
| 19 | a) Compare Fixed-point arithmetic and floating point arithmetic. (4M)<br>b) Explain the sampling rate conversion by L/M (or I/D) factor. (6M) | 5 | L2 |
| | OR | | |
| 20 | Explain in detail about Interpolation and Decimation with examples. (10M) | 5 | L2 |