



**B.E/B.TECH DEGREE EXAMINATIONS: NOV/DEC 2023**

(Regulation 2018)

Fifth Semester

**ELECTRICAL AND ELECTRONICS ENGINEERING**

U18EET5005: Digital Signal Processing

**COURSE OUTCOMES**

- CO1: Understand the different types of signals and systems and its applications.  
 CO2: Apply various methods of transformation techniques and analyze the systems.  
 CO3: Compute, simulate and analyze the DFT using FFT algorithms.  
 CO4: Design and realize digital IIR and FIR filters.  
 CO5: Understand the architectures and programming aspects of DSP processor.

**Time: Three Hours**

**Maximum Marks: 100**

**Answer all the Questions:-**

**PART A (10 x 2 = 20 Marks)**

**(Answer not more than 40 words)**

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|---|-----|-------------------|
| 1. Define Sampling Theorem for a band limited signal.   | CO1 | [K <sub>1</sub> ] |
| 2. Draw the ECG signal and list the possible heart diseases that can be identified using ECG. | CO1 | [K <sub>1</sub> ] |
| 3. Write the properties of ROC of Z transform.  | CO2 | [K <sub>1</sub> ] |
| 4. Determine Z-transform of the sequence $x(n) = \{2, 1, -1, 0, 3\}$                          | CO2 | [K <sub>3</sub> ] |
| 5. Find the values $W_N^{2k}$ when $N = 8$ and $K = 2$ and also for $K = 3$ .                 | CO3 | [K <sub>3</sub> ] |
| 6. Compute DFT of the sequence $x(n) = \{1, 2, 3, 4\}$ .                                      | CO3 | [K <sub>3</sub> ] |
| 7. Why do we go for analog approximation to design a digital filter?                          | CO4 | [K <sub>2</sub> ] |
| 8. What is Gibb's Phenomenon?   | CO4 | [K <sub>1</sub> ] |
| 9. Outline the factors that influence the selection of DSP processor.                         | CO5 | [K <sub>2</sub> ] |
| 10. State the purpose of PWM generation unit in DSP processor                                 | CO5 | [K <sub>1</sub> ] |

**Answer any FIVE Questions: -**

**PART B (5 x 16 = 80 Marks)**

**(Answer not more than 400 words)**

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|--|---|-----|-------------------|
| 11. a) Determine the values of Power and Energy of the signal $x(n) = 2 \sin\left(\frac{n\pi}{4}\right)$ . | 8 | CO1 | [K <sub>2</sub> ] |
| b) Examine the system described by the expression $y(n) = x(-n)$ is static, linear and time invariant.     | 8 | CO1 | [K <sub>2</sub> ] |

12. A causal LTI system is described by the difference equation  $y(n) - 3y(n-1) - 4y(n-2) = x(n) + 2x(n-1)$  16 CO2 [K<sub>3</sub>]  
 Find i) The impulse response of the system using Z transform.  
 ii) Plot the Poles and Zeros of H(z).  
 iii) Check whether the system is stable or not?
13. A discrete time sequence is given by  $x(n) = \{1, 1, 1, 1, 1, 1, 1, 1\}$ . Use DIT FFT algorithm for generating X(k). 16 CO3 [K<sub>3</sub>]
14. Using bilinear transformation, design a Butterworth lowpass filter which satisfies the following conditions. 16 CO4 [K<sub>3</sub>]  
 $0.8 \leq |H(e^{j\omega})| \leq 1 ; 0 \leq \omega \leq 0.2\pi$   
 $|H(e^{j\omega})| \leq 0.2 ; 0.6\pi \leq \omega \leq \pi$
15. a) Describe the architecture of TMS320F281 processor with neat sketch. 10 CO5 [K<sub>2</sub>]  
 b) Explain the concept of DSP based speed control of PMSM motor with suitable schematic. 6 CO5 [K<sub>2</sub>]
16. Design a digital FIR low-pass filter using rectangular window by taking 9 samples of w(n) and with a cutoff frequency of 1.2 rad/sec. 16 CO4 [K<sub>3</sub>]

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