

**BACHELOR OF VOCATION**  
**Automotive Mechatronics**  
**Subject: Digital Signal Processing**  
**Subject Code: ABEC-301**  
**Semester: Fifth**  
**December 2021**  
**Theory (External): 35 Marks**  
**Time: 03 hours**

**Instructions to the Students**

1. This Question paper consists of two Sections. All sections are compulsory.
2. Section A comprises 10 questions of objective type in nature. All questions are compulsory. Each question carries 1 mark.
3. Section B comprises 8 essay type questions out of which students need to do any 5. Each question carries 5 marks.
4. Read the questions carefully and write the answers in the answer sheets provided.
5. Do not write anything on the question paper.
6. Wherever necessary, the diagram drawn should be neat and properly labelled

**Roll Number**

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**SECTION -A (OBJECTIVE TYPE QUESTIONS)**  
(10x1=10 Marks)

- A Define continuous time signal.
- B Which system is called as time invariant system?
- C How to establish stability through Z-Transform.
- D Explain Scaling property of Z-Transform.
- E Write name of any two digital filter.
- F What is Nyquist rate?
- G What is the Fourier series representation of a signal  $x(n)$  whose period is  $N$ ?
- H What is the set of all values of  $z$  for which  $X(z)$  attains a finite value?
- I What is the ROC of  $z$ -transform of finite duration anti-causal sequence?
- J Both discrete and periodic in one domain are also periodic and discrete in other domain (True / False)

**SECTION -B (ESSAY TYPE QUESTIONS)**  
(5x5=25 Marks)

1. Find the  $z$  transform of the sequence?  
 $x(n) = \{ 1, 1, 2, 5, -1 \}$  '2' is at origin
2. Find the 4-point DFT of the sequence  $x(n) = \{ 1, 2, 0, 2 \}$  using DIT-FFT algorithm.
3. An Analog filter has a transfer function  
$$H(s) = \frac{10}{s^3 + 11s^2 + 23s + 11}$$
  
Design a filter equivalent to using Impulse Invariant method for  $T=1$  sec.
4. Draw the block diagrams using the direct and canonic forms for the LTI system whose transfer function is:-  
$$H(z) = \frac{1 - 3z^{-1} + 2z^{-2}}{1 + 0.3z^{-1} - 0.1z^{-2}}$$
5. Given the system function.  
$$H(z) = \frac{1 + 2z^{-1}}{1 + \frac{3}{4}z^{-1} + \frac{1}{4}z^{-2}}$$
  
Realize using Ladder structure.
6. Write properties of Bilinear Transformation.
7. Write the steps for the calculation of IDFT using DIT-FFT.
8. Explain the difference between decimation and interpolation?

===END OF PAPER===