



**WEST BENGAL STATE UNIVERSITY**

B.Sc. Honours 6th Semester Examination, 2021

**ELSADSE06T-ELECTRONICS (DSE3/4)**

Time Allotted: 2 Hours

Full Marks: 40

*The figures in the margin indicate full marks.  
Candidates should answer in their own words and adhere to the word limit as practicable.  
All symbols are of usual significance.*

**GROUP-A**

1. Answer any **five** questions from the following: 2×5 = 10
- (a) State Parseval's energy theorem.
  - (b) Define convolution sum.
  - (c) What is the necessary and sufficient condition for system stability?
  - (d) Define ROC. What should be ROC for a causal system?
  - (e) What is the difference between linear convolution and circular convolution?
  - (f) Calculate the number of multiplications needed in the calculation of DFT and FFT with 64 point sequence. Hence find the speed improvement.
  - (g) Find out the DFT of  $x(n) = \{2, 1, 2, 1\}$ .
  - (h) Compare DFT and DTFT.

**GROUP-B**

**Answer any six questions from the following**

**5×6 = 30**

2. The impulse response of an LTI system is  $h(n) = \{1, 2, 1, -1\}$ . Determine the response of the system to the input signal  $x(n) = \{1, 2, 3, 1\}$ .
3. Prove that the sequences (i)  $x(n) = a^n u(n)$  and (ii)  $x(n) = -a^n u(-n-1)$  have the same  $X(Z)$  and differ only in ROC.
4. Find the inverse Z-transform of  $X(Z) = (z^2 + z)/(z-1)(z-3)$ .
5. Establish the relationship between Z-transform and Fourier Transform.
6. (a) The DFT of a real signal is  $X(k) = \{1, A, -1, B, 0, -j2, C, -1 + j\}$ . Find values of  $A, B, C$ .

- (b) Determine the pole and zero plot in the Z plane for the system described difference equation and hence find its stability 3+2

$$y(n) = x(n) + 2x(n-1) - 4x(n-2) + x(n-3).$$

7. Obtain the (i) Direct form II (ii) parallel realizations for the following system 2+3

$$y(n) = 3y(n-1)/4 - y(n-2)/8 + x(n) + x(n-1)/3.$$

8. (a) Write short notes on Unit sample sequence.

- (b) What is “warping effect” with respect to realization of digital filters? How can it be avoided?  $2\frac{1}{2} + 2\frac{1}{2}$

9. Write down the procedure for design of FIR filter using frequency sampling method.

10. Discuss in brief on the effect of Finite Register Length in Digital Signal Processing.

11. Write down the basic differences between IIR and FIR filter.

12. Design a filter with monotonic response in the pass-band and gives a maximum attenuation of 3 dB upto 2 kHz and minimum attenuation of 20 dB or more beyond 4 kHz. Use the bilinear transformation technique to obtain  $H(z)$  of the filter.

**N.B. :** Students have to complete submission of their Answer Scripts through E-mail / Whatsapp to their own respective colleges on the same day / date of examination within 1 hour after end of exam. University / College authorities will not be held responsible for wrong submission (at in proper address). Students are strongly advised not to submit multiple copies of the same answer script.

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