

B. Tech. 5th Semester (ECE)
Examination – December, 2022

DIGITAL SIGNAL PROCESSING

Paper : PCC-ECE-307-G

Time : Three Hours]

[Maximum Marks : 75

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt five questions in all, selecting one question from each Unit. Question No. 1 is compulsory. All questions carry equal marks.

1. (a) Define nyquist rate. 2.5
- (b) Check the signal linear or nonlinear
 $Y(n) = \alpha s(n) + \beta$. 2.5
- (c) Explain in brief the region of convergence. 2.5
- (d) Explain in brief the advantages of DSP over ASP. 2.5
- (e) What are the advantages of FIR filters over IIR filters ? 2.5
- (f) Explain in brief the applications of z transform. 2.5

UNIT – I

2. State and explain the sampling theorem. Derive an expression for the sampling theorem. How will you reconstruct the original signal from its samples ? What is aliasing effect in this and how it can be minimized. 15
3. (a) State and prove the properties of z transform. 8
- (b) Find the inverse z transform of : 7

$$X[z] = \frac{z[z+1]}{[z-1]3[z-2]}$$

ROC : $|z| > 2$ using partial fraction method.

UNIT – II

4. (a) Explain and prove the properties of DFT. 8
 - (b) Discuss the parsevals identity. 7
 5. Perform the circular convolution of following sequences : 15
- $$x(n) = \{1, 2, 2, 1\}$$
- $$h(n) = \{1, 2, 3, 4\}$$

UNIT – III

6. Design IIR filter by Bilinear transformation with frequency warping effect. Convert the analog filter into digital filter by using Bilinear transformation take $\omega T = \pi/4$ & $\Omega c = 3$ having system function : 15

$$H(s) = \frac{(s + 0.1)}{(s + 0.1)^2 + 9}$$

7. (a) Design FIR filter using window technique. What is gibbs phenomenon in this ? 10
 (b) Compare IIR and FIR filters. 5

UNIT - IV

8. Realize the following system by direct form I and direct form II for the system function is given by : 15

$$H(Z) = \frac{0.28Z^2 + 0.319Z + 0.04}{0.5Z^3 + 0.3Z^2 + 0.17Z - 0.2}$$

9. Write short notes on :
 (a) Digital filter bank 8
 (b) Interpolator and decimator 7