Roll No. ....

24422

B. Tech. 7th Semester (EE)
(Common with Special Chance)
Examination – December, 2019
DIGITAL SIGNAL PROCESSING
Paper : ECE-409

Time : Three Hours] [Maximum Marks : 100

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. Question No. **1** is *compulsory*. Attempt other *four* question by selecting *one* question from each Section. All questions carry equal marks.

1. Answer the following briefly : $4 \times 5 = 20$
   (a) Differentiate between FIR and IIR filters.
   (b) What are the properties of Region of Convergence (ROC) ?
   (c) Discuss Digital Filter Banks.
   (d) What are the various advantages of MDSP ?
   (e) Determine whether the following system is stable or not :

   $$y(n) = ax(n + 1) \, bx(n - 1)$$

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SECTION – A

2. (a) Write the major classification of Signals. 10
   (b) Discuss the classification of system with examples. 10

3. Discuss the various properties of Discrete Time Fourier Transform in detail. 20

SECTION – B

4. (a) State and explain Sampling Theorem. Also explain the process of reconstruction of the signal from its samples. 15
   (b) Give application of Sampling Theorem. 5

5. (a) Design a high pass filter using Hamming Window with a cut off frequency of 1.2 rad/sec and N 9. 15
   (b) Write applications of Z-transform. 5

SECTION – C

6. (a) Draw and Explain the structure for linear phase FIR Filter. 10
   (b) What are different design techniques of digital filters ? Explain Bi-linear transformation designing techniques for filters. 10

7. (a) Explain in detail the rectangular window technique for FIR filter design. 12
   (b) What are applications of DSP ? Explain. 8

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SECTION – D

8. (a) Determine direct form I and direct form II realization for a 3rd order IIR transfer function : 15

$$H(z) = (0.25z^2 + 0.419z + 0.2) / (0.3z^2 + 0.2z^2 + 0.15z - 0.2)$$

   (b) Compare Analog and Digital filters. 5

9. Explain : 5 × 4 = 20

   (a) Interpolator

   (b) Interpolation Filter

   (c) Sampling rate conversion

   (d) Decimator