9. (a) What are uniform DFT filter banks ? Explain in detail. 10

(b) Write the short note on the following : 10

(i) Filter Structure

(ii) Multistage decimator and interpolator

B.Tech. 7th Semester (F) Scheme (EE) Examination,

December-2018

DIGITAL SIGNAL PROCESSING

Paper-ECE-409-F

Time allowed : 3 hours] *[Maximum marks : 100*

***Note : Question no. 1 is compulsory**. Attempt **one** question from each section.*

1. (a) What are the advantages of digital signal processing ? 4

(b) Find the Z transform of u[n] and draw its ROC. 4

(c) Differentiate between analog & digital Filters. 4

(d) What is FIR System ? Compare an FIR System with an IIR System. 4

(e) Explain sampling rate conversion process. 4

Section-A

2. (a) Explain the system and its classification. 10

(b) Find the 4-point DFT of the sequence

$x(n) = \cos\frac{n\pi}{4}$. 10

3. (a) Explain in detail various properties of discrete Fourier transform (DFT). 10

(b) Draw the structure of cascade and parallel realization of the system characterized by : 10

$$H(Z) = \frac{(1-Z^{-1})^3}{\left(1-\frac{1}{2}Z^{-1}\right)\left(1-\frac{1}{8}Z^{-1}\right)}$$

Section-B

4. (a) State and prove the sampling theorem. Draw the spectrum of a sampled signal and also explain the aliasing effect. 12

(b) Determine the Z-transform of

$x(n) = \cos \omega_0 n$ for $n \geq 0$. 8

5. (a) Determine the inverse Z-Transform of X(Z) by using partial fraction expansion method : 14

$$X(Z) = \frac{Z}{3Z^2 - 4Z + 1}$$

If the ROC are :

(i) $|Z| > 1$

(ii) $|Z| < \frac{1}{3}$

(iii) $\frac{1}{3} < |Z| < 1$

(b) Explain the different properties of region of convergence (ROC) of Z-transform. 6

Section-C

6. (a) Explain the design steps of IIR filter by Bi-linear transformation method and also discuss the warping effect. 14

(b) Using bilinear transformation obtain H(Z)

if $H(S) = \frac{1}{(S+1)^2}$ and T = 0.1 s. 6

7. (a) Obtain the mapping formula for the approximation of derivatives method using backward difference. 10

(b) Explain in detail the rectangular window technique for FIR filter design. 10

Section-D

8. (a) What is the need for multirate digital signal processing (MDSP) ? Write the various advantages and application of MDSP. 10

(b) Explain the interpolation process for an integer factor L with an example. 10