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BIELE-014

B.Tech. – VIEP – ELECTRONICS AND COMMUNICATION ENGINEERING (BTECVI)

00019

Term-End Examination

December, 2017

BIELE-014 : MULTIRATE SYSTEMS

Time : 3 hours *Maximum Marks : 70*

Note : *Answer any* ***seven*** *questions. All questions carry equal marks. Missing data, if any, may be suitably assumed. Use of scientific calculator is permitted.*

1. (a) Define Down sampling and Up sampling with suitable examples. *5*

(b) Explain the need of multirate signal processing with suitable examples. *5*

2. With the help of a block diagram, explain the sampling rate conversion by a rational factor (L/M). Obtain necessary expressions. *10*

3. (a) Consider a uniform DFT analysis filter bank with two polyphase components. Let the polyphase components be $E_0(z) = 1 + 3z^{-1}$ and $E_1(z) = 2 + 4z^{-1}$. Find the expression for $H_k(z)$ for k = 0, 1. *5*

(b) Describe the various methods for the cancellation of aliasing error in the Quadrature Mirror Filter (QMF) banks. *5*

4. State the theorem for the Perfect Reconstruction (PR) property. Derive the expression for the PR with necessary conditions. *10*

5. (a) What is Imaging Error ? How can it be minimised in the Quadrature Mirror Filter (QMF) banks. *5*

(b) Give the analysis of distortion transfer function and aliasing in a two-channel quadrature mirror filter bank. *5*

6. Design a perfect reconstruction system and determine an expression for sub-band coding gain. *10*

7. (a) Differentiate different filter banks with equal pass bandwidth and unequal pass bandwidth. *5*

(b) Explain amplitude and phase distortion errors created by the filter banks system with necessary diagram and expressions. *5*

8. (a) How are Finite Impulse Response Perfect Reconstruction (FIRPR) systems helpful in the factorization of polyphase matrics ? *5*

(b) With the help of an example, explain round-off noise in filter banks. *5*

9. Draw and explain the block diagram of M-channel Linear Phase Perfect Reconstruction (LPPR) filter banks with necessary expressions. *10*

10. (a) What are the necessary conditions required for linear phase property ? *5*

(b) What are Quantization Effects ? List out various types of quantization effects in filter banks. *5*