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BIELE-014

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

00023 **Term-End Examination**

June, 2018

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 multirate systems and list their advantages. *5*

(b) Describe the designing of interpolator with required diagram. *5*

2. (a) Consider the signal $x(n) = a^n u(n)$, $|a|<1$ Determine the DTFT $X(e^{j\omega})$.

(b) The signal x(n) is applied to a decimator that reduces the sampling rate by a factor of 2. Determine the output spectrum $Y(e^{j\omega})$.

(c) Show that the spectrum in part(b) is the DTFT of y'(n) = x(2n). *3+3+4=10*

3. (a) Discuss the Nyquist criterion used in sampling theorem. *5*

(b) What is a set of necessary and sufficient conditions in terms of P(Z) for complete cancellation of aliasing error in the Quadrature Mirror Filter (QMF) banks ? *5*

4. With the help of neatly labelled block diagram, give the polyphase representation of a decimated uniform Discrete Fourier Transform (DFT) filter bank. *10*

5. (a) What are aliasing and imaging errors created by the filter bank systems ? How can they be rectified ? *5*

(b) What is sub-band coding gain ? How can it be calculated in the filter bank system ? *5*

6. What are perfect reconstruction systems in a M-Channel filter bank ? Also give the necessary and sufficient conditions for perfect reconstruction. *10*

7. What are the necessary conditions for linear phase property ? Give the lattice structure for Linear Phase Perfect Reconstruction (LPPR) FIR QMF Bank. *4+6=10*

8. Derive expressions and explain sampling rate conversion by a rational factor (L / M). *10*

9. Write down the various steps for the synthesis of M-channel Linear Phase Perfect Reconstruction (LPPR) filter banks. Explain with the help of an appropriate example. *10*

10. Write short technical notes on any ***two*** of the following : *2×5=10*

    (a) Power symmetry in QMF banks

    (b) Dynamic range of filter bank

    (c) Co-efficient sensitivity effects

    (d) Round-off noise