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Code No.: 5132 M

VASAVI COLLEGE OF ENGINEERING (Autonomous), HYDERABAD
M.E. (CBCS : ECE) I-Semester Make up Examinations, March-2017

(Communication Engineering & Signal Processing)

Advance Digital Signal Processing

Time: 3 hours

Max. Marks: 70

Note: Answer ALL questions in Part-A and any FIVE from Part-B

Part-A (10 × 2 = 20 Marks)

1. What are the conditions for linear phase response of a system?
2. Define Anti-aliasing filter and Anti-imaging filter.
3. Draw the block diagram of a first order SDM oversampling ADC.
4. How to study the performance of a digital filter?
5. What is the need of Multi rate sampling frequencies?
6. Show that the following two transformations are equal when L and M are relatively prime.



7. What are uniform DFT filter banks?
8. Explain about analysis and synthesis bank.
9. What are the basis signals?
10. Write the dilation equation using scaling coefficients and wavelet coefficients.

Part-B (5 × 10 = 50 Marks)

11. a) Discuss and formulate the sampling of bandpass signals. [3]
 b) Consider a second order SDM oversampling 1 bit ADC system with sampling rate of 512 KHz and maximum analog signal frequency of 4 KHz. Determine the effective ADC resolution. [4]
 c) Draw the DTMF tone Generator schematic for tone '7' [3]
12. a) Discuss finite word length effects in IIR filter. [3]
 b) Design a lowpass digital filter with 3 dB cut off frequency at 50 Hz and attenuation of at least 10 dB for frequencies larger than 100 Hz. Assume sampling frequency as 500 Hz. [7]
13. a) List and explain any two applications of Interpolation and Decimation. [3]
 b) Design a two stage interpolator to increase the sampling rate from 600 Hz to 9 KHz and compare its complexity with a single stage interpolator. The interpolator filter should satisfy the following specifications: [7]

passband edge	:	200 Hz
stopband edge	:	300 Hz
passband ripple	:	1 dB
stopband ripple	:	60 dB.

14. a) Explain about QMF filter banks and what is the condition to eliminate aliasing effect. [4]
 b) Consider a two channel QMF bank with the analysis and synthesis filters given by [6]

$$H_0(z) = 2 + 6z^{-1} + z^{-2} + 5z^{-3} + z^{-5}$$

$$H_1(z) = H_0(-z)$$

$$G_0(z) = H_0(z)$$

$$G_1(z) = -H_1(z)$$
 (i) Is the QMF bank alias free?
 (ii) Is the QMF bank a perfect reconstruction system?
15. a) Explain the limitations of FT and STFT in detail with an example. [5]
 b) Explain wavelet decomposition process. [5]
16. a) Write about Chirp transform. [3]
 b) The sampling frequency 3072 KHz of a signal is to be decimated by a factor of 64 to bring it down to 48 KHz for which the passband and stopband ripples for the decimator are 0.001 and 0.0001 respectively. The passband ranges from 0.20 KHz. Design a two stage decimator with decimation factors 16 and 4 for the first and second stages. [7]
17. Write short notes on any *two* of the following:
 a) Sampling rate conversion by a rational factor. [5]
 b) Tree structured filter banks. [5]
 c) Wavelet reconstruction. [5]
