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SAINTGITS COLLEGE OF ENGINEERING
KOTTAYAM, KERALA

(AN AUTONOMOUS COLLEGE AFFILIATED TO
APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIRST SEMESTER M.TECH. DEGREE EXAMINATION (R), MARCH 2021
(TELECOMMUNICATION ENGINEERING)

Course Code: 20ECTET107

Course Name: ADVANCED DIGITAL SIGNAL PROCESSING

Max. Marks: **60** **Duration:** **3 Hours**

PART A

(Answer all questions. Each question carries 3 marks)

1. Describe fractional sampling rate conversion.
2. Implement uniform filter bank using polyphase decomposition.
3. What is Heisenberg's uncertainty principle in time and frequency analysis
4. Explain the orthogonality of Haar scaling function and Haar wavelet function.
5. Explain periodogram averaging
6. Describe Yule-Walker equations.
7. What are the augmented Wiener-Hopf equations for linear prediction filters?
8. Illustrate the block diagram of adaptive noise canceller.

PART B

(Answer one full question from each module, each question carries 6 marks)

MODULE I

9. Describe basic multirate operations in digital domain with suitable demonstration in time domain. (6)

OR

10. Illustrate the aliasing effect in frequency domain caused by down sampling with example. (6)

MODULE II

11. Illustrate the polyphase structure for fractional sampling rate converter. (6)

OR

12. Illustrate two channel quadrature mirror filter banks using polyphase representation. (6)

MODULE III

13. Explain Short Time Fourier Transform with various window functions. (6)

OR

14. Explain continuous wavelet transform in detail. (6)

MODULE IV

15. Describe the procedure of multi resolution analysis with necessary diagrams. (6)

OR

16. A half sinusoid, defined by, (6)

$$f(x)=\begin{cases}\sin \pi x & 0 \le x < 1\\ 0 & \text{otherwise}\end{cases}$$

is to be approximated by Haar scaling functions in function space V_0 and refined by Haar wavelet functions in space W_0 and W_1. Determine the scaling and wavelet functions and their associated coefficients.

MODULE V

17. Explain the development of Yule-Walker equations for the estimation of AR coefficients for a given zero-mean discrete time series $\{x_i\}_1^N$ taken as an AR process. (6)

OR

18. Describe the Blackman-Tuckey method of smoothing the periodogram. (6)

MODULE VI

19. Explain Levinson – Durbin algorithm in detail. (6)

OR

20. Explain the steepest – descent algorithm and its application to Wiener filter (6)

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