Reg. No.															

Question Paper Code	12757

M.E. / M.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2024

Second Semester

M.E. - Communication Systems

20PCOPC204 – ADVANCED DIGITAL SIGNAL PROCESSING

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	State Wiener Khintchine theorem.	2	K1	CO1
2.	List the drawback of least square method.	2	K1	CO1
3.	Write the procedure for smoothening of periodogram.	2	K2	CO2
4.	Differentiate AR and ARMA signal models.	2	K2	CO2
5.	List the applications of kalman filter.	2	K1	CO3
6.	What you mean by least mean square error?	2	K1	CO3
7.	List the properties of LMS adaptive algorithm.	2	K1	CO5
8.	Why LMS is normally preferred over RLS algorithm?	2	K2	CO5
9.	What is sub-band coding?	2	K1	CO6
10.	Write the advantages of multistage implementation in multirate signal processing.	2	K1	CO6

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

			Marks	K – Level	CO
11.	a)	Compute the Power spectral density of $r_x(k) = \delta(k) + 2 * (0.5)^{\lvert k \rvert}$ $r_x(k) = 2 * \delta(k) + j\delta(k-1) - j\delta(k+1)$	13	K2	CO1
		OR			
	b)	A random process x(n) is generated by filtering unit variance white noise v(n) with a first order LTI system having the transfer function $H(z) = \frac{1}{1 - 0.25z^{-1}}$ Determine the autocorrelation of the random process x(n).	13	K2	CO1

12.	a) i)	Classify non parametric and parametric method.	*4*	*K2*	*CO2*
	ii)	Explain the welch method for periodogram averaging.	*9*	*K2*	*CO2*
		OR			
	b)	Derive the appropriate equations and discuss the Yule-Walker method of power spectrum estimation.	*13*	*K2*	*CO2*
13.	a)	Derive wiener hopf equations and minimum mean square error for the FIR wiener filter.	*13*	*K3*	*CO3*
		OR			
	b)	Estimate a random variable 'y' in terms of an observation of another random variable 'x'.	*13*	*K3*	*CO3*
14.	a)	Explain steepest descent algorithm for FIR adaptive filters.	*13*	*K2*	*CO5*
		OR			
	b)	Illustrate the performance of adaptive channel equalization and adaptive echo cancellation.	*13*	*K2*	*CO5*
15.	a)	Construct a two stage decimator for the following specifications D=100, pass band $0 \leq F \leq 50$ HZ, Transition band $50 \leq F \leq 55$ HZ, and input sampling rate 10KHZ, Ripple S1= 1/10 and S2= 1/1000.	*13*	*K3*	*CO6*
		OR			
	b)	Illustrate the interpolation and decimation process in multirate signal processing.	*13*	*K3*	*CO6*

PART - C (1 × 15 = 15 Marks)

16.	a)	Determine the FIR filter coefficient for the direct form structure given a 3 stage lattice structure with coefficient $k_1 = 1/4$, $k_2 = 1/2$, $k_3 = 1/3$.	*15*	*K3*	*CO4*
		OR			
	b)	A process is modelled by $r_x(k) = [2, 0.5(1+j), 0.5]^T$. Determine the second order all pole model by Levinson-Durbin algorithm.	*15*	*K3*	*CO4*