Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME – SEMESTER – I (New)– EXAMINATION – WINTER-2019

Subject Code: 3710501 **Date: 07-01-2020**

Subject Name: Advanced Digital Signal Processing

Time: 02:30 PM TO 05:00 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	Explain the Impulse Invariance method to design IIR butterworth filter.	**07**
	(b)	Design a linear phase FIR digital filter for a given specification using hamming window of length M=7	**07**

$$Hd(w) = \begin{cases} e^{-j3w}, & w \le \frac{\pi}{6} \\ 0, & \frac{\pi}{6} \le w \le \pi \end{cases}$$

Q.2	**(a)**	Obtain the system function H(Z) for the system described by y(n) – 3y(n-1) + 2y(n-2) = x(n) – x(n-1) Realize the filter using (i) Cascade form (ii) Parallel form	**07**
	(b)	Define Wide Sense Stationary Process ad explain its properties.	**07**
		OR	
	(b)	Define and explain Ergodic process. Explain concept of ensemble average and time average.	**07**
Q.3	**(a)**	Derive the Yule Walker equation for ARMA (p,q) process.	**07**
	(b)	Derive Power Spectral Density of output when random process x(t) passes through LTI system having impulse response h(t)	**07**
		OR	
Q.3	**(a)**	Explain Forward Linear Prediction problem in brief.	**07**
	(b)	Derive Winner-hopf equation for a filtering problem	**07**
Q.4	**(a)**	Derive weight update equation of LMS algorithm from steepest descent algorithm	**07**
	(b)	Explain NLMS algorithm in brief	**07**
		OR	
Q.4	**(a)**	Explain the Properties of Liner Prediction error Filters.	**07**
	(b)	Discuss Kalman Filtering problem in details	**07**
Q.5	**(a)**	Explain the Recursive Least-Squares Algorithm.	**07**
	(b)	What is sub band coding? How is it achieved with the help of multi rate DSP?	**07**
		OR	
Q.5	**(a)**	What is DWT? Explain the structure of DWT filter bank.	**07**
	(b)	Explain the application of DSP in image Processing.	**07**

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