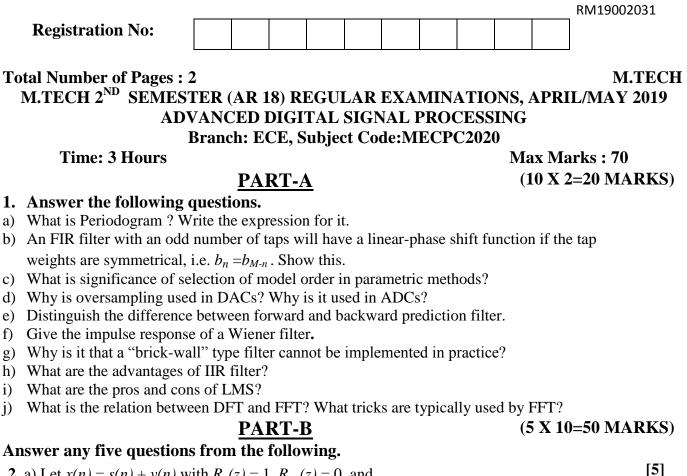
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2. a) Let x(n) = s(n) + v(n) with $R_{v}(z) = 1$, $R_{sv}(z) = 0$, and

$$R_{S}(Z) = \frac{0.75}{(1 - 0.5_{Z}^{-1})(1 - 0.5_{Z})}$$

Determine the optimum filters for the estimation of s(n) and s(n-2) from $\{x(k)\}_{-\infty}^{n}$ and the corresponding MMSEs.

b) (i)Show that a unit vector **w** is an eigenvector of the matrix $\mathbf{H} = \mathbf{I} - 2\mathbf{w}\mathbf{w}^{H}$. What is the [5] corresponding eigenvalue?

[5]

(ii) If a vector \mathbf{z} is orthogonal tow, show that \mathbf{z} is an eigenvector of \mathbf{H} . What is the corresponding eigenvalue?

3.a) Solve the following LS problem

$$\mathbf{X} = \begin{bmatrix} 1 & -2 & -1 \\ 2 & 0 & 1 \\ 2 & -4 & 2 \\ 4 & 0 & 0 \end{bmatrix} \qquad \mathbf{y} = \begin{bmatrix} -1 \\ 1 \\ 1 \\ -2 \end{bmatrix}$$

by computing the QR decomposition using the GS algorithm.

b) If $r(l) = \cos \omega_0 l$, determine the second-order prediction error filter and check whether it is [5] minimum-phase.

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4.a) Evaluate the value of X (K) if x (n) = $(-1)^n$, $0 \le n \le 7$ using DIF-FFT algorithm.	02031 [5]
b) Explain about Decimation and interpolation with the help of polyphase filters.	[5]
5. a) Determine the frequency resolution of Bartlett, Welch and Blackman-Tukey methods of power spectrum estimates for a quality factor Q=10. Assume that overlap in Welch method is 50% and length of sample sequence is 1024.	[5]
b) Find a relationship between the minimum-norm pseudo spectrum and the all-pole model spectrum in the case of an infinite signal-to-noise ratio.	[5]
6.a)Discuss the procedure for the design of IIR filters and what are the constraints in the design of IIR filters using analog structures .	[5]
b) The exponential density function is given by $f_x(x) = \frac{1}{a}e^{-x/a}u(x)$	[5]
where <i>a</i> is a parameter and $u(x)$ is a unit step function.	
 (<i>i</i>) Plot the density function for a = 1. (<i>ii</i>) Determine the mean, variance, skewness, and kurtosis of the Rayleigh random variable with a = 1. Comment on the significance of these moments in terms of the shape of the density function. (<i>iii</i>) Determine the characteristic function of the exponential pdf. 	
7. a) Derive the equations for the a priori RLS lattice-ladder algorithm with error feedback.	[5]
b) Determine the impulse response of an all-pole system with lattice parameters $k_1 = 0.2$ $k_2 = 0.3$ $k_3 = 0.5$ $k_4 = 0.7$ Draw the direct- and lattice form structures of the above system.	[5]
8. Write short notes on :a) Optimum filtersb) Lattice structures	[5] [5]
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