

Q.P.Code: 35736

(3 Hours)

Total Marks: 80

- N.B. : (1) Questions No.1 is compulsory.
 (2) Solve any three questions out of remaining five questions
 (3) Draw neat labeled diagram whenever necessary
 (4) Assume suitable data if necessary.

Q.1 Solve any four out of five

- i) What are ocular artefacts? Brief with suitable plots. 5
 ii) With a neat sketch explain QRS template. 5
 iii) Describe audio processing for reverberation effect with block diagram and mathematical concept. 5
 iv) Explain Time and Frequency Trade-off for wavelet Transform. 5
 v) Brief about Adaptive Linear Combiner with neat diagram 5

Q.2 a) Explain an adaptive noise cancelling system. 10
 b) With neat diagrams explain the three basic filters used in equalization of digital audio signals. 10

Q.3 a) Derive RLS Algorithm and discuss it's merits and demerits. 10
 b) Derive and explain Yule-Walker method for AR Model parameters 10

Q.4 a) Derive the expression for Widrow Hoff LMS Adaptive algorithm. 10
 b) Write any two properties of Haar wavelet. 10
 For the signal $f = (2, 2, 2, 4, 4, 4)$, find its first level Haar transform and verify the result by using its inverse Haar transform.

Q.5 a) Draw neat sketches and explain with block diagram detection of fetal heartbeats during labour. 10
 b) Derive mathematical expressions and explain how to smoothing the Periodogram using Blackman-Tukey method. 10

Q.6 a) Explain the applications of Wavelet theory in Speckle Removal and Signal Compression. 10
 b) A quadratic MSE function for Wiener filter is given as 10

$$J = 40 - 20w + 10w^2,$$

Find the optimal solution for w^* to achieve the minimum MSE J_{\min} and Also determine J_{\min} . Use initial value of $w = 0$, step size = 0.04, run steepest descent algorithm for three iterations.