

Total No. of Pages: 2

- 315 -

Roll No.....

**THIRD SEMESTER  
SUPPLEMENTARY EXAMINATION**

**M. Tech (SP&DD)  
FEB-2019**

**EC-7214 New Technologies in Image Processing**

**TIME: 03 Hrs**

**Maximum Marks:100**

**Note:**

- 1) Attempt any FIVE questions.
- 2) Assume suitable missing data, if any.

**Q.1**

[a] What are the different steps of EMD? What is the most common stopping criterion used for EMD? (10)

[b] What are the limitations of EMD and EEMD? Compare EEMD with CEEMD. (10)

**Q.2**

(3 + 3 + 4 = 10)

[a] Explain following terms/parameters:-

- i. Opening and closing operators and their use for signal denoising.
- ii. Selection of Structuring Element (SE) for ECG baseline denoising.
- iii. Energy analysis using Hilbert-Huang Transform (HHT).

[b] What are the applications of Dilation and Erosion operators? For given A and B, calculate (i) Internal Boundary of A (ii) External Boundary of A and (iii) Morphological Gradient of A. (10)

$$A = \begin{bmatrix} 0 & 1 & 1 & 0 \\ 1 & 0 & 1 & 1 \\ 1 & 1 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{bmatrix} \quad B = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 1 & 1 & 0 \end{bmatrix}$$

**Q.3**

[a] What are the different signal dependent noise in biomedical signals? Explain in detail to Poisson Noise, Film Grain Noise and Speckle Noise. (10)

P. T. O

[b] Write short notes on following :- (5 + 5 = 10)

- i. Use of multi-frame averaging for noise minimization
- ii. Transformation of signal dependent noise to signal independent noise

**Q.4**

[a] What are the differences between Discrete Wavelet Transform (DWT) and Stationary Wavelet Transform (SWT)? What are the advantages of SWT based filtering over DWT based filtering for EMG denoising of ECG? (10)

[b] What is singular spectrum analysis (SSA) of signal? Explain all steps of SSA and compare it with EMD. (10)

**Q.5**

[a] What are the various prior estimators, applied on wavelet coefficients of an image by capturing the sparseness of the wavelet expansions? Explain EM algorithm based hyper-parameters estimator, used to estimate the parameters of BKF density. (10)

[b] Explain the Nonlocal Means (NLM) algorithm and selection of followings parameters of NLM Filter :- (10)

- i. Patch size ( $P$ )
- ii. Half-width ( $M$ )
- iii. Bandwidth ( $\lambda$ )

**Q.6 Write short notes on followings :- (2 x 10 = 20)**

[a] Adaptive Wavelet Wiener Filtering (AWWF) method for ECG denoising

[b] Distance Regularised Level Set (DRLS) model and Adaptive Shape Prior Constrained Coupled Directional Level Set method.