

**Faculty of Engineering & Technology**  
**M.E. Electrical & Elect. Sem-II (New-C.G.S.) Examination**  
**ELECTIVE-II : DIGITAL IMAGE PROCESSING**  
**Paper—2 EEEME 5**

Time : Three Hours]

[Maximum Marks : 80

**INSTRUCTIONS TO CANDIDATES**

- (1) Due credit will be given to neatness and adequate dimensions.
- (2) Assume suitable data wherever necessary.
- (3) Diagrams and equations should be given wherever necessary.
- (4) Illustrate your answers wherever necessary with the help of neat sketches.
- (5) Use of slide rule, Logarithmic tables, Drawing instrument and Non-programmable calculator is permitted.
- (6) Discuss the reaction, mechanism wherever necessary.
- (7) Use pen of blue/black ink/refill only for writing the answer book.

1. (a) If an image  $f(m,n), 0 \leq m \leq M-1$  and  $0 \leq n \leq N-1$  is multiplied by the checkerboard pattern  $(-1)^{m+n}$ , then show that its DFT is centred at  $\left(\frac{M}{2}, \frac{N}{2}\right)$  8
- (b) Give the advantages of Walsh transform over Fourier Transform. 5

**OR**

2. (a) Explain the property of energy compaction of a unitary transform. Why this property is useful in image processing ? Also compare the energy compaction of DCT with respect to DFT. 8
- (b) Explain properties and applications of SVD. 5

3. A 4×4, 4 bits/pixel original image is given by

$$\begin{bmatrix} 10 & 12 & 8 & 9 \\ 10 & 12 & 12 & 14 \\ 12 & 13 & 10 & 9 \\ 14 & 12 & 10 & 12 \end{bmatrix}$$

Sketch the histogram of the original image. Apply histogram equalisation to the image and also sketch the histogram of histogram-equalised image. 13

**OR**

4. (a) What is point operation in image enhancement ? Explain the image enhancement by using
- (i) Brightness adjustment,
  - (ii) Contrast adjustment 6
- (b) Explain in detail image enhancement by
- (i) Thresholding,
  - (ii) Gray-level slicing. 7
5. (a) Associated with average filter, explain trimming criteria and R and S factors such that it will be a trimmed average filter. 6
- (b) A blue filter is given by

$$h(m, n) = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 2 & 2 & 1 \\ 1 & 2 & 2 & 1 \\ 1 & 1 & 1 & 1 \end{bmatrix}$$

Obtain a deblur filter  $G(k, L)$  using pseudo-inverse filter approach with

(i)  $\epsilon=0.05$ , and

(ii)  $\epsilon=0.15$  8

**OR**

6. (a) What is iterative method of image restoration ? Explain in detail with its Flow chart. Give its advantages and disadvantages. 8
- (b) What do you mean by Blind deconvolution ? Give its classification with examples. 6
7. (a) Explain in detail Hough Transform. Also explain piece wise linear boundary fitting with the Hough transform. 6
- (b) What is active contour ? Explain in detail Greedy-snake algorithm and its problems. 7

**OR**

8. (a) Explain in detail image segmentation based on Thresholding. Also explain Histogram-based threshold selection. 7
- (b) Explain in detail the following method of edge detection
- (i) Laplacian of Gaussian (LOG), and
- (ii) Difference of Gaussian Filter (DOG) 6
9. (a) What is redundancy ? Give its classification and explain. 5
- (b) Obtain the Huffman code for the word 'COMMITTEE' 8

**OR**

10. A source emits four symbols (a, b, c, d) with the probabilities 0.4, 0.2, 0.1 and 0.3 respectively. Construct arithmetic coding to encode and decode the 'word dad'. 13
11. (a) Give the advantages of wavelet based image compression. Explain in detail sub-band coding of 2D signal. 9
- (b) Compare the CWT and DWT. 5

**OR**

12. (a) Explain watermarking and cryptography. 7
- (b) Give the classification of watermarking methods and applications of it. 7

