

(3 hours)

Marks:[80]



- N.B. 1. Question No. 1 is compulsory  
2. Attempt any **three** out of remaining  
3. Assume suitable data if **necessary** and justify the assumptions  
4. Figures to the **right** indicate full marks

- Q.1. (a) Explain unitary matrix. [05]  
(b) Explain opening and closing operations in terms of dilation and erosion. [05]  
(c) Explain zero memory operations. [05]  
(d) Explain fundamental steps in Image Processing. [05]
- Q.2. (a) Explain DCT and its properties. Find the DCT for the following image [10]

2	0	1	0
1	1	0	1
1	0	0	1
2	1	2	3

- (b) What are the different types of redundancies in digital image? Give methods to remove those redundancies. [10]
- Q.3. (a) Explain global processing via graph theoretic technique. Find the optimal path for the following image. [10]

2	2	7
2	7	5
0	1	5

- (b) What is image segmentation? Explain the principles of and differences among the three basic approaches to region growing, region splitting and merging and thresholding. [10]
- Q.4. (a) A digital image with 8 quantization level is given below. Perform Histogram equalization. [10]  
 $f(x,y) = |x-y|$   
for  $x=0$  to  $7$   
 $y=0$  to  $7$
- (b) Justify/contradict the following statement :- [10]  
a) Enhancement process does not add any information to the image.  
b) Shape number uniquely describes an object.

- Q.5. (a) Find the Arithmetic codeword for the sequence a1a2a2a3a3 for the symbol a1 a2 and a3 with following frequencies : [10]

Source Symbol	Frequency
a1	0.2
a2	0.4
a3	0.4

- (b) State & prove symmetry & periodicity property of DFT. Explain basic difference between DFT and DCT. [10]
- Q.6. Write short notes on (Any two) [20]
- Moments, Normalised moment and Central moments
  - Fidelity criteria
  - HSI color model
  - Edge linking using Hough transform
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