# University of Mumbai
# Examination 2020- Inter Cluster

Program: BE Instrumentation Engineering

Curriculum Scheme: Revised 2016

Examination: Final Year Semester VII

Course Code and Course Name: ISDLO7031 Image Processing

Time: 1hour Max. Marks: 80

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Q.1] Note to the students: - All Questions are compulsory and carry equal marks. Marks 40

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| Q1. | What is the effect caused by the use of an insufficient number of samples in a digital image called? |
| Option A: | Image Enhancement |
| Option B: | Checkerboard Effect |
| Option C: | Quantization |
| Option D: | False Contouring |
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| Q2. | What is the storage requirement of a 1024X1024, 32 level gray scale image? |
| Option A: | 5,242,880 |
| Option B: | 3,145,728 |
| Option C: | 1,048,576 |
| Option D: | 1,310,720 |
| | |
| Q3. | Consider two pixels p and q whose coordinates are (0, 0) and (9, 2). What would be the $D_4$ distance between p and q? |
| Option A: | 6 |
| Option B: | 11 |
| Option C: | 9 |
| Option D: | 18 |
| | |
| Q4. | Two pixels p and q with values from V are 4-adjacent if |
| Option A: | q is in the set $N_4(p)$ |
| Option B: | q is in the set $N_D(p)$ |
| Option C: | q is in the set $N_8(p)$ |
| Option D: | q is in $N_D(p)$ and the set $N_4(p) \cap N_4(q)$ has pixels whose values are from V |
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| Q5. | If matrix T is Unitary matrix, then which of the following is true? |
| Option A: | T*' = T |
| Option B: | TT'=I |
| Option C: | y=Tx |
| Option D: | TT*'=I |
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| Q6. | Which of the following is the widely used linear transform in data compression to |

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| | reduce the high memory and bandwidth requirement? |
| Option A: | Discrete Cosine Transform |
| Option B: | Discrete Sine Transform |
| Option C: | Hartley Transform |
| Option D: | Walsh Hadamard Transform |
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| Q7. | Compute discrete Walsh Transform of the data sequence [1,5,0,7]' |
| Option A: | {1, -1, 0, √2} |
| Option B: | [1,2,0,3]' |
| Option C: | [13,-1,3,-11]' |
| Option D: | [13,-1,3,-11] |
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| Q. 7 | Compute Hadamard Transform of the sequence [1,2,3,4]' |
| Option A: | [10,-2,-4,0]' |
| Option B: | [0,-4,-2,10]' |
| Option C: | [10,-2,-4,0] |
| Option D: | [0,-4,-2,10] |
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| Q8. | Which filter is more effective in reducing sharp transitions in gray levels from the digital images? |
| Option A: | Median Filter |
| Option B: | Averaging Filter |
| Option C: | Wiener Filter |
| Option D: | High Pass Filter |
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| Q9. | Find the negative of the digital image with 8 gray levels and given by the matrix f (x, y) = [1 3 5; 4 4 3; 5 2 2] |
| Option A: | g (x, y) = [7 5 3; 4 4 5; 3 6 6] |
| Option B: | g (x, y) = [5 3 2; 2 2 3; 1 4 4] |
| Option C: | g (x, y) = [2 4 6; 5 5 4; 6 3 3] |
| Option D: | g (x, y) = [6 4 2; 3 3 4; 2 5 5] |
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| Q10. | Which piecewise linear transformation highlights a specific range of gray levels in an image? |
| Option A: | Power Law Transformation |
| Option B: | Contrast Stretching |
| Option C: | Bit Plane Slicing |
| Option D: | Gray Level Slicing |
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| Q11. | What is the difference between Histogram Equalization and Histogram Matching? |
| Option A: | Histogram Equalization is to produce an output image that has low contrast histogram, Histogram Matching is to take an input image and generate an output image that is based upon the shape of a reference histogram |
| Option B: | Histogram Equalization is to produce an output image that has a flattened histogram, Histogram Matching is to take an input image and generate an output image that is based upon the shape of a reference histogram |
| Option C: | No difference, both methods generate same result |
| Option D: | Histogram Equalization is to produce an output image that has a flattened |

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| | histogram, Histogram Matching is to take an input image and generate an output image that is not based on the shape of a reference histogram |
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| Q12. | Which of the following Arithmetic/Logic Operation is suitable for mask mode radiography? |
| Option A: | NOT Logic Operator |
| Option B: | OR Logic Operator |
| Option C: | Image Subtraction |
| Option D: | Image Averaging |
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| Q13. | The first order derivative of the digital image can be obtained through which of the following operators. Select correct operator. |
| Option A: | The Elliptic Operator |
| Option B: | The Laplacian Operator |
| Option C: | The Difference Operator |
| Option D: | The Gradient Operator |
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| Q14. | Opening smoothens the image's |
| Option A: | Pixels |
| Option B: | Lines |
| Option C: | Contour |
| Option D: | Boundary |
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| Q15. | With dilation process images get |
| Option A: | Thinner |
| Option B: | Shrinked |
| Option C: | Thickened |
| Option D: | sharpened |
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| Q16. | Closing produces |
| Option A: | Narrow breaks |
| Option B: | Lines |
| Option C: | Dots |
| Option D: | noise |
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| Q17. | What would be the value of first derivative approximation at the point of transition into and out of the ramp? |
| Option A: | Nonzero |
| Option B: | Negative |
| Option C: | Positive |
| Option D: | Zero |
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| Q18. | Which mask out of the following should be used for finding Vertical Line? |
| Option A: | [-1 2 -1; -1 2 -1; -1 2 -1] |
| Option B: | [2 -1 -1; -1 2 -1; -1 -1 2] |
| Option C: | [-1 -1 -1; 2 2 2; -1 -1 -1] |
| Option D: | [-1 -1 2; -1 2 -1; 2 -1 -1] |
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| Q19. | A gradient operator for edge detection is |
| Option A: | Prewitt |
| Option B: | Second order derivative |
| Option C: | Zero crossing operator |
| Option D: | Median |
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| Q20. | Which of the following methods is not used for Image Compression? |
| Option A: | Discrete Cosine Transform |
| Option B: | Discrete Fourier Transform |
| Option C: | Walsh Hadamard Transform |
| Option D: | Discrete Sine Transform |
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| Q.2 | Solve any two. Marks 20 |
| 1 | Generate Huffman code for the given image space. Calculate (i) Average code length (ii) Compression ratio compared to the standard binary encoding.<br><br>Levels: 0 1 2 3 4 5 6 7<br>Probability: 0.06 0.02 0.3 0.5 0.04 0.01 0.03 0.04 |
| 2 | Write short note on (any two)<br>1) Opening 2) Closing 3) Dilation 4) Erosion |
| 3 | Write short note on – Point, line and edge detection |

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| Q.3 | Solve any two. Marks 20 |
| 1 | Explain Discrete Cosine Transform and compute DCT for the given image.<br><br>4 2 1 2<br>1 0 2 0<br>2 1 0 2<br>1 2 4 2 |
| 2 | Write expression for D4, D8, Dm and Euclidean distance. Also calculate D4 for the given matrix between p and q with V= {0,1}.<br><br>3 1 2 1q<br>2 2 0 2<br>1 2 1 1<br>p1 0 1 2 |
| 3 | A 64X64 image, represented by 3 bits/pixel has following gray level distribution.<br><br>$r_k$: 0 1 2 3 4 5 6 7<br>$n_k$: 790 1023 850 656 329 245 122 81<br><br>Perform Histogram Equalization and give new distribution of gray levels. Show plots of the original and the equalized images. |