No. of Printed Pages : 4

Sl. No.

C7-R4 : DIGITAL IMAGE PROCESSING & COMPUTER VISION

DURATION : 03 Hours **MAXIMUM MARKS : 100**

Roll No. : | | | | | | |

Answer Sheet No. : | | | | | | |

Name of Candidate : _____ **; Signature of Candidate :** _____

INSTRUCTIONS FOR CANDIDATES :

- Carefully read the instructions given on Question Paper, Answer Sheet.
- Question Paper is in English language. Candidate has to answer in English Language only.
- **Question paper contains Seven questions. The Question No. 1 is compulsory. Attempt any FOUR Questions from Question No. 2 to 7.**
- **Parts of the same question should be answered together and in the same sequence.**
- **Questions are** to be answered in the **ANSWER SHEET** only, supplied with the Question Paper.
- **Candidate cannot leave the examination hall/ room without signing on the attendance sheet and handing over his/her Answer Sheet to the Invigilator. Failing in doing so, will amount to disqualification of Candidate in this Module/Paper.**
- After receiving the instruction to open the booklet and before answering the questions, the candidate should ensure that the Question Booklet is complete in all respects.

DO NOT OPEN THE QUESTION BOOKLET UNTIL YOU ARE TOLD TO DO SO.

1. (a) Discuss, how can you convert colors from HSI to RGB model.
(b) What is pseudocolor ? Briefly discuss.
(c) Highlight the advantages and disadvantages of Digital Image Processing.
(d) In context of digital image processing, differentiate between sampling and quantization.
(e) What is image pyramid ? Briefly discuss lowpass and bandpass pyramids.
(f) Differentiate between dilation and erosion in context of morphological operations.
(g) Briefly discuss some of the commonly used techniques for motion estimation. **(7x4)**

2. (a) What is parallel projection ? Briefly discuss along with different types of parallel projection.
(b) Canny Edge Detector and Laplacian of Gaussian are Gradient based edge detection operators. Briefly discuss each of the above operators along with their advantages and limitations. **(9+9)**

3. (a) What is Haar Transform ? Briefly discuss its properties. Also, obtain the Haar transformation matrix(s) for $N=2$, $N=4$, and $N=8$.
(b) What is structure from motion ? Briefly discuss. Also discuss structure from motion from two views and structure from motion from multiple views. **(9+9)**

4. (a) In context of data compression, differentiate between
(i) Lossless and lossy compression
(ii) Fixed length and variable length coding
(b) Variable-length codes can be strictly nested in order of decreasing generality as non-singular codes, uniquely decodable codes and prefix codes. Briefly discuss each of them. **(9+9)**

5. (a) Use the 3×3 mask given in Figure A to perform the convolution process on the shaded pixels in the 5×5 image given in Figure B. Write the filtered image after performing the convolution process.

0	**1/6**	**0**
1/6	**1/3**	**1/6**
0	**1/6**	**0**

Figure A: Given 3×3 mask

30	40	50	70	90
40	**50**	**80**	**60**	100
35	**255**	**70**	**0**	120
30	**45**	**80**	**100**	130
40	50	90	125	140

Figure B: The 5×5 image with shaded pixels

(b) In context of image processing, briefly discuss the frequency domain filters and its types.
(c) Write in brief the following components of Digital Image Processing System :
(i) Image sensors or sensing,
(ii) Specialized image processing hardware,
(iii) Mass storage,
(iv) Image displays,
(v) Hard copy devices. **(6+6+6)**

6. (a) Briefly discuss opening and closing operation in context of morphology.

(b) In context of morphological dilation and erosion operations, briefly discuss Structuring Elements.

(c) Briefly discuss the applications of Digital Image Processing in Visible & Infrared Bands, Microwave Band, and Radio Band. **(6+6+6)**

7. (a) Briefly discuss Bit-Plane Slicing. Illustrate the process of Bit-Plane Slicing using the following grayscale image :

3	6	5	2	0
1	4	7	2	3
4	2	0	6	5
3	1	5	7	4
6	4	2	1	0

(b) The default method of snakes has various limitations which results into several alternative approaches. Briefly discuss the GVF Snake Model and the Balloon Model along with their limitations. **(9+9)**

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SPACE FOR ROUGH WORK