CLASS: B.Tech.   SEMESTER : VII
BRANCH: ECE   SESSION : MO/2024

SUBJECT: EC431 DIGITAL IMAGE AND VIDEO PROCESSING

TIME: 3 Hours   FULL MARKS: 50

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

		CO	BL

Q.1(a) Consider the image segment shown below. Let the intensities in domain be V = {1, 2}. [5] 1 III
Compute the lengths of shortest 4-path, 8-path, and m-path between p and q, if the
particular path does not exist between these two points, explain why.

$$
\begin{array}{cccc}
5 & 1 & 2 & 1 \quad (q)\\
2 & 1 & 0 & 2\\
1 & 2 & 1 & 1\\
(p)\ 1 & 0 & 1 & 4
\end{array}
$$

Q.1(b) Consider the 5x5 image matrix **I** and 3x3 kernel matrix **K** shown below. [5] 1 II

$$
I = \begin{array}{ccccc}
1 & 1 & 1 & 1 & 1\\
1 & 2 & 2 & 2 & 1\\
1 & 2 & 0 & 2 & 1\\
1 & 2 & 2 & 2 & 1\\
1 & 1 & 1 & 1 & 1
\end{array}
\qquad
K = \begin{array}{ccc}
1 & -2 & 1\\
2 & 1 & 2\\
1 & -2 & 1
\end{array}
$$

Perform i) Convolution and ii) Correlation operations between I and K. (Do not zero pad
the image I)

Q.2(a) Mention the relation between RGB and CMYK color models. Write a short note on pseudo- [5] 2 I
color image processing and mention one of its applications.

Q.2(b) Explain degradation and restoration process in images with an appropriate model. [5] 2 I

Q.3(a) Consider a matrix as shown below with 4 data points and 2 feature values each. Compute [5] 3 III
the principal components PC1 and PC2 of this feature matrix and project the features
onto the principal components.

Feature	D1	D2	D3	D4
X1	2	3	4	5
X2	4	6	8	10

Q.3(b) Describe the steps to segment an image into two classes of intensity values using Otsu's [5] 3 I
global thresholding method. Derive an optimum global threshold value, *k* to separate the
two classes of pixels.

Q.4(a) Use arithmetic encoding to find the range of probabilities for transmitting the sequence 'IMAGE' from left to right. The probability of occurrence for each source symbol is given below. [6] 4 III

Symbol	I	M	A	G	E
Probability	0.2	0.2	0.2	0.1	0.1

Q.4(b) Describe the steps to encode an image using JPEG compression standard. [4] 4 I

Q.5(a) Define motion vector and explain motion estimation using a block diagram. Also, mention how motion estimation contributes to improved video compression. [4] 5 I

Q.5(b) Explain various steps involved in H.261 standard for video compression. Also, mention the drawbacks of H.261 standard and how they are eliminated by MPEG compression standard. [6] 5 I

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