

Hall Ticket Number:

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Code No. : 17655 (A) N/O

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD

Accredited by NAAC with A++ Grade

B.E. (I.T.) VII-Semester Main & Backlog Examinations, Dec.-23/Jan.-24

Digital Image & Video Processing (PE-IV)

Time: 3 hours

Max. Marks: 60

Note: Answer all questions from Part-A and any FIVE from Part-B

Part-A (10 × 2 = 20 Marks)

| Q. No. | Stem of the question | M | L | CO | PO | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------------------|---|---|---|----|----|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | List out the applications of digital image processing and explain any one application in detail. | 2 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2. | What is Sampling and quantization in the process of Digitization of an image? | 2 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. | Explain contrast stretching point transformation | 2 | 1 | 2 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4. | Compare frequency domain and spatial domain transformations in digital image processing | 2 | 1 | 2 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5. | Define similarity-based segmentation | 2 | 1 | 3 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6. | Show mask for point and edge detection in an image | 2 | 1 | 3 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7. | List out the types of redundancies present in the image and explain briefly. | 2 | 1 | 4 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8. | Give the run length code for the following image? <table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td></tr> <tr><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td></tr> <tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> </table> | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 4 | 1 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | 1 | 1 | 1 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 1 | 1 | 1 | 1 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9. | Define image morphology and list out the applications of morphological operations | 2 | 1 | 5 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10. | Perform Erosion operation on the following Image. <table style="margin-left: auto; margin-right: auto;"> <tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td></tr> <tr><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td></tr> <tr><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td></tr> </table> <div style="margin-left: 100px;"> $[\underline{1} \ \underline{1} \ 0]$ str. element </div> <div style="margin-left: 100px;"> ← Image </div> | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 2 | 2 | 5 | 1 | | | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 1 | 1 | 1 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | 1 | 1 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | 1 | 1 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Part-B (5 × 8 = 40 Marks) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11. a) | Describe the steps in digital image processing with neat diagram | 4 | 2 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|----|---|----|----|---|---|---------------|---|---|---|---|---|------------|---|----|----|---|----|----|---|---|---------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| b) | Define 4 connectivity, 8 connectivity and M connectivity between the pixels in an image | 4 | 2 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12. a) | For the following image perform Histogram equalization and draw the resultant image histogram. | 4 | 3 | 2 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>Grey level</td> </tr> <tr> <td>5</td><td>10</td><td>15</td><td>5</td><td>10</td><td>10</td><td>2</td><td>7</td><td>No of pixels.</td> </tr> </table> | | | | | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Grey level | 5 | 10 | 15 | 5 | 10 | 10 | 2 | 7 | No of pixels. | | | | | | | | | | | | | | | | | |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Grey level | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 10 | 15 | 5 | 10 | 10 | 2 | 7 | No of pixels. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| b) | Perform following Point operations on the given image i) Negative ii) Logrthmic transformations | 4 | 2 | 2 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $\begin{pmatrix} 15 & 12 & 10 \\ 08 & 06 & 04 \\ 02 & 01 & 0 \end{pmatrix}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13. a) | Explain Hough transformation in image segmentation? Using Hough transformation show that the points (2, 2), (3, 3), (4, 4) are collinear. | 4 | 2 | 3 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| b) | Apply region growing on the following image with initial point at (2,2) and threshold value as 2. use 4 – connectivity. | 4 | 3 | 3 | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table style="margin-left: auto; margin-right: auto;"> <tr><td>0</td><td>1</td><td>2</td><td>0</td></tr> <tr><td>2</td><td>5</td><td>6</td><td>1</td></tr> <tr><td>1</td><td>4</td><td>7</td><td>3</td></tr> <tr><td>0</td><td>2</td><td>5</td><td>1</td></tr> </table> | | | | | | 0 | 1 | 2 | 0 | 2 | 5 | 6 | 1 | 1 | 4 | 7 | 3 | 0 | 2 | 5 | 1 | | | | | | | | | | | | | | | | | | | |
| 0 | 1 | 2 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 5 | 6 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 4 | 7 | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 2 | 5 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Starting point (2,2), absolute difference < or = 2 and 4 –connectivity. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14. a) | Design a Code for the following string using LZW coding method. String: 1 0 0 0 1 1 0 1 1 1 1 1 0 0 1 1 1 1 0 1 0 1 | 4 | 3 | 4 | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| b) | Consider the Probabilities of A =0.2 B =0.1, C= 0.3 & D=0.4. Find the code for the string 'CADB', Using Arithmetic encoding and decode the same. | 4 | 3 | 4 | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15. a) | Define Hit and Miss transforms and perform closing operation on the following image | 4 | 3 | 5 | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td></tr> <tr><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td></tr> <tr><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td></tr> <tr><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td></tr> <tr><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td></tr> </table> | | | | | | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 0 | 1 | 1 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 1 | 1 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 1 | 1 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | 1 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 0 | 1 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr><td>1</td><td>1</td><td>1</td></tr> </table> | | | | | | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| structuring Element | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| b) | Extract External Boundary for the following image using morphological operation. | 4 | 3 | 5 | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------|---|-----------|-----------|------|-----|-------|--------|-------|--------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|--|--|--|--|
| | Image | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table border="1"> <tr><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td></tr> <tr><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td></tr> <tr><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td></tr> </table> | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Str.Element | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table border="1"> <tr><td>1</td><td>1</td><td>1</td></tr> </table> | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16. a) | Find out i) city block distance and ii) chessboard distance for the following 7 x 5 gray level image by assuming 4 sets of points in the image. | 4 | 3 | 1 | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table border="1"> <tr><td>15</td><td>10</td><td>12</td><td>8</td><td>10</td><td>11</td><td>12</td></tr> <tr><td>11</td><td>10</td><td>13</td><td>15</td><td>15</td><td>14</td><td>15</td></tr> <tr><td>14</td><td>11</td><td>12</td><td>16</td><td>15</td><td>17</td><td>16</td></tr> <tr><td>11</td><td>10</td><td>11</td><td>11</td><td>15</td><td>14</td><td>14</td></tr> <tr><td>16</td><td>15</td><td>14</td><td>14</td><td>15</td><td>13</td><td>12</td></tr> </table> | 15 | 10 | 12 | 8 | 10 | 11 | 12 | 11 | 10 | 13 | 15 | 15 | 14 | 15 | 14 | 11 | 12 | 16 | 15 | 17 | 16 | 11 | 10 | 11 | 11 | 15 | 14 | 14 | 16 | 15 | 14 | 14 | 15 | 13 | 12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15 | 10 | 12 | 8 | 10 | 11 | 12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | 10 | 13 | 15 | 15 | 14 | 15 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | 11 | 12 | 16 | 15 | 17 | 16 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | 10 | 11 | 11 | 15 | 14 | 14 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16 | 15 | 14 | 14 | 15 | 13 | 12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| b) | Consider the Image shown in figure. Find out the contrast stretched image | 4 | 3 | 2 | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table border="1"> <tr><td>45</td><td>35</td><td>30</td><td>20</td></tr> <tr><td>25</td><td>35</td><td>30</td><td>28</td></tr> <tr><td>50</td><td>55</td><td>60</td><td>62</td></tr> <tr><td>10</td><td>5</td><td>8</td><td>12</td></tr> </table> | 45 | 35 | 30 | 20 | 25 | 35 | 30 | 28 | 50 | 55 | 60 | 62 | 10 | 5 | 8 | 12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 45 | 35 | 30 | 20 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 25 | 35 | 30 | 28 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 50 | 55 | 60 | 62 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | 5 | 8 | 12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table border="1"> <tr><th>Old Value</th><th>New Value</th></tr> <tr><td>0-20</td><td>0-8</td></tr> <tr><td>20-32</td><td>9 - 48</td></tr> <tr><td>32-64</td><td>49 -64</td></tr> </table> | Old Value | New Value | 0-20 | 0-8 | 20-32 | 9 - 48 | 32-64 | 49 -64 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Old Value | New Value | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0-20 | 0-8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 20-32 | 9 - 48 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 32-64 | 49 -64 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 17. | Answer any <i>two</i> of the following: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| a) | Apply region splitting and merging on the following image | 4 | 3 | 3 | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table border="1"> <tr><td>6</td><td>5</td><td>6</td><td>6</td><td>7</td><td>7</td><td>6</td><td>6</td></tr> <tr><td>6</td><td>7</td><td>6</td><td>7</td><td>5</td><td>5</td><td>4</td><td>7</td></tr> <tr><td>6</td><td>6</td><td>4</td><td>4</td><td>3</td><td>2</td><td>5</td><td>6</td></tr> <tr><td>5</td><td>4</td><td>5</td><td>4</td><td>2</td><td>3</td><td>4</td><td>6</td></tr> <tr><td>0</td><td>3</td><td>2</td><td>3</td><td>3</td><td>2</td><td>4</td><td>7</td></tr> <tr><td>0</td><td>0</td><td>0</td><td>0</td><td>2</td><td>2</td><td>5</td><td>6</td></tr> <tr><td>1</td><td>1</td><td>0</td><td>1</td><td>0</td><td>3</td><td>4</td><td>4</td></tr> <tr><td>1</td><td>0</td><td>1</td><td>0</td><td>2</td><td>3</td><td>5</td><td>4</td></tr> </table> | 6 | 5 | 6 | 6 | 7 | 7 | 6 | 6 | 6 | 7 | 6 | 7 | 5 | 5 | 4 | 7 | 6 | 6 | 4 | 4 | 3 | 2 | 5 | 6 | 5 | 4 | 5 | 4 | 2 | 3 | 4 | 6 | 0 | 3 | 2 | 3 | 3 | 2 | 4 | 7 | 0 | 0 | 0 | 0 | 2 | 2 | 5 | 6 | 1 | 1 | 0 | 1 | 0 | 3 | 4 | 4 | 1 | 0 | 1 | 0 | 2 | 3 | 5 | 4 | | | | |
| 6 | 5 | 6 | 6 | 7 | 7 | 6 | 6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | 7 | 6 | 7 | 5 | 5 | 4 | 7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | 6 | 4 | 4 | 3 | 2 | 5 | 6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 4 | 5 | 4 | 2 | 3 | 4 | 6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 3 | 2 | 3 | 3 | 2 | 4 | 7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | 0 | 0 | 2 | 2 | 5 | 6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 0 | 1 | 0 | 3 | 4 | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 0 | 1 | 0 | 2 | 3 | 5 | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| b) | Code the following string using Huffman method. | 4 | 3 | 4 | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | String abcfaacabfacebadcabfabdfc | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| c) | Explain Block based motion estimation model for image compression with suitable diagrams | 4 | 2 | 5 | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

M : Marks; L: Bloom's Taxonomy Level; CO; Course Outcome; PO: Programme Outcome

| | | |
|------|-------------------------------|-----|
| i) | Blooms Taxonomy Level – 1 | 20% |
| ii) | Blooms Taxonomy Level – 2 | 30% |
| iii) | Blooms Taxonomy Level – 3 & 4 | 50% |
