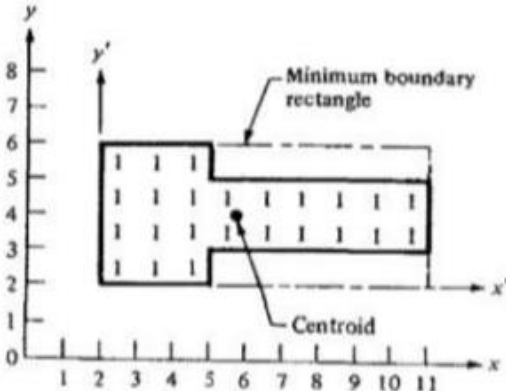


## Module 3

## Module 3a: Machine Vision

|   |   |    |   |   |
|---|---|----|---|---|
| 1 | Draw the block diagram of a machine vision system. Explain functions of each block in machine vision system.  | 10 | 2 | 3 |
| 2 | With necessary diagrams illustrate working principle of Charge couple devices. With neat diagram explain charge device imager.  | 10 | 2 | 3 |
| 3 | Draw a neat cross section diagram of videcon tube. Explain the working principal of videcon tube.   | 10 | 2 | 3 |
| 4 | What do you mean by image segmentation? Explain various segmentation techniques.  | 10 | 2 | 3 |
| 5 | <p>Consider the schematic of the image Fig (1), Calculate the area, the minimum aspect ratio, the diameter, the centroid, and the thinness measures of the image.</p>  <p>The diagram shows a 2D coordinate system with x and y axes. The x-axis ranges from 0 to 11, and the y-axis ranges from 0 to 8. A binary image is plotted with pixels represented by '1's. The image consists of a 3x3 block of pixels from x=2 to x=4 and y=2 to y=4, and a horizontal bar of pixels from x=5 to x=10 and y=3 to y=5. A dashed rectangle encloses the entire shape, with its bottom-left corner at (2, 2) and its top-right corner at (10, 5). A dot marks the centroid of the shape at approximately (6.5, 4). Labels include 'Minimum boundary rectangle' pointing to the dashed box and 'Centroid' pointing to the dot.</p> <p>Fig (1): Schematic of pixel pattern</p> | 7  | 5 | 3 |

## Module 3b: Artificial Intelligence (AI)

|    |   |           |   |   |
|----|---|-----------|---|---|
| 6  | Describe the various types of knowledge which may require representation  | 10        | 2 | 4 |
| 7  | <b>List out and explain various techniques for representing knowledge.</b>  | <b>10</b> | 2 | 4 |
| 8  | Describe some of the areas of AI which are presently being pursued as distinct areas of research.   | 10        | 2 | 4 |
| 9  | <b>With necessary diagrams explain following search methods.</b><br><div style="display: flex; justify-content: space-around;"> <span>(a) Breadth first search</span> <span>(b) Depth first search</span> </div> <div style="display: flex; justify-content: space-around;"> <span>(c) Hill Climbing</span> <span>(d) Best First Search</span> </div> | <b>10</b> | 2 | 4 |
| 10 | Design a semantic network for the following information.<br><i>Jack is a student. Jack is a roboticist. Roboticists play games. Roboticists may be students. Students may be roboticists</i>  | 5         | 5 | 4 |

|                 |  |  |  |  |  |  |  |  |  |
|-----------------|--|--|--|--|--|--|--|--|--|
| <b>Module 4</b> |  |  |  |  |  |  |  |  |  |
|-----------------|--|--|--|--|--|--|--|--|--|

**Module 4a: Robot cell design and control, Material Transfer, Machine Loading/Unloading**

|    |   |    |   |   |
|----|---|----|---|---|
| 11 | List basic types robot cell layouts.  | 2  | 2 | 5 |
| 12 | With necessary diagrams explain types of robot cell layouts.                              | 10 | 2 | 5 |
| 13 | With necessary diagram explain transfer system used in inline robot cell.                 | 6  | 2 | 5 |
| 14 | List out and explain other considerations in workcell Design.                             | 10 | 2 | 5 |
| 15 | In the context of an automated machining cell tabulate the error sources and error types. | 10 | 2 | 5 |
| 16 | List out and explain general categories of Recovery strategies in robot workcell.         | 10 | 2 | 5 |