Duration: 3Hrs.   **Total Marks: 80**

N.B.
1) Question **number 1** is compulsory
2) Attempt **any three** out of the remaining **five questions**.
3) Assume suitable data if **necessary** and justify the assumptions.
4) **Draw** neat and **clean** diagrams
5) Figures to the **right** indicate full marks

Q1   **20**
a) Discuss any two applications of Image Processing in Machine Vision
b) Explain the difference of Normalized Box Filter and Gaussian Filter
c) Explain and illustrate the processing of 2D, 3D, and 4D Images
d) State in brief the Emerging Vision Trends in Manufacturing

Q2 a) Explain in details the concept of Spatial Transformation and Affine Transformation   **10**
       used in computer vision
       b) Describe any two methods of motion analysis used in machine vision.   **10**

Q3 a) Compare Area Scan, Line Scan and Smart Cameras used for image acquisition   **10**
       b) Explain in detail which type of lighting is suitable for specific application with   **10**
       justification

Q4 a) Describe spatial and affine transformation with its specific application   **10**
       b) Explain the process of identifying different types of vehicles through machine   **10**
       vision and name the necessary machine vision components.

Q5 a) Distinguish between first and second order derivative operators used in image   **10**
       segmentation stating their demerits.
       b) What are the different methods of Object Recognition in image processing? Explain   **10**
       anyone with an example.

Q6   Write short notes on: **20**
a) Difference between Dilation and Erosion
b) Role of machine vision in Industry 4.0
c) Fundamental Steps in Digital Image Processing
d) Define Points, Edges, and Vertices with respect to image processing

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