(3 Hours) **Total Marks 80**

NB
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) Figures to the **right** indicate full marks

Q1 Attempt the following **20**
a) Relate in your own words Computer/Machine Vision and Image Processing and state their three primary applications.
b) What are the Fundamental Steps in Digital Image Processing?
c) Explain and illustrate the role of filtering on an image.
d) Describe the importance of machine vision and industry 4.0 in industrial automation

Q2 a) Explain briefly the following characteristics of illumination, Diffuse light, Directed light, Front light, Back light, Dark field **10**

b) Explain with an example how region based segmentation is done on an image **10**

Q3 a) What are the basic morphological operations, explain them with their mathematical equations. Describe the role of a structuring element on an image for machine vision applications. **10**

b) A grayscale transformation is applied directly onto a grayscale image to manipulate its pixel values (assuming the range is [0,255]). Draw the diagrams for the following greyscale transformations: i) thresholding the image at pixel value 100. ii) linearly stretch the intensity in the interval [100,200] to [0,255] with necessary explanations. **10**

Q4 a) Describe how to evaluate extracted shape descriptors in 2D and 3D vision **10**

b) Explain the process of identifying road signs in vehicle vision systems and name the necessary machine vision components. **10**

Q5 a) Explain in brief how to select a camera with the right choice of lens and sensor for a machine vision system? **10**

b) Describe affine transformation with an example. How bicubic interpolation can be used for processing of digital images. **10**

Q6 Write in short **20**
a) What are Interest Points in computer vision, how does it help in correspondence motion analysis.
b) Write short notes on 3D imaging
c) Explain any one edge detection technique of an image
d) Two similarities between Computer versus Human Vision Systems, Two differences between CCD and CMOS Image Sensors

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