Nirma University

Institute of Technology

Semester End Examination (IR), February - 2022

B. Tech. in CSE / ME, Semester-VII

2ICOE02 Machine Vision

Roll No. with date | Supervisor's initial with date

Time: 2 Hours | Max. Marks: 50

Instructions:
1. Attempt all questions.
2. Figures to right indicate full marks.
3. Draw neat sketches wherever necessary.
4. Assume suitable data, if required.

CLO 1 Explain the basic concepts of machine vision techniques and domains of application
CLO 2 Analyze and evaluate basic machine vision systems
CLO 3 Select hardware components and processing algorithm for applications
CLO 4 Design and build small scale machine vision systems for a variety of application domains

Q.1 [A] Answer the followings. **[06]**

CLO 3, L2

a) Discuss edge detection in details. Mention the applications of edge detection.

b) Explain the image acquisition techniques used in a vision system with applications.

Q.1 [B] State the different components of typical machine vision system. Explain the integration aspect of the vision system. **[06]**

CLO 3, L2

Q.2 [A] Discuss contour analysis and its applications. **[06]**

CLO 1, L2

Q.2 [B] Answer the following: **[08]**

CLO 1, L3

a) Calculate the first order derivative and second order derivative. Draw the plots of intensity for both derivatives.

86	88	90	93	87	85	92	93	95	90	65	66	68

b) Calculate the value of center pixels when the below mentioned filters are applied.

i. Median filter
ii. Max filter
iii. Min filter
iv. 3*3 averaging filter

Image data is given in below table.

251	249	253
247	23	240
243	241	247

Q.3 [A] **CLO 4, L6** Design a machine vision application to sort the objects using machine vision system and robotic arm. The application is to identify the presence of object, locate the object and determine the orientation of the object for robotic pick and place. The object size is 80 mm * 80 mm. The sorting is to carried out at a speed of 120 objects per minute. **[14]**

Consider the following points while designing the application - Calculate field of view, camera resolution and other features required, focal length of lens, sensors, rejection hardware, lights, computing resources, issues and challenges to deploy the system etc. Assume suitable data in order to design the system.

OR

Q.3 [A] **CLO 4, L6** Design a machine vision application to inspect tablets packed in a blister for defects. Maximum size of blister is 120 mm * 180 mm. Speed of inspection required is 150 blisters per minute. **[14]**

Consider the following points while designing the application - Calculate field of view, camera resolution and other features required, focal length of lens, sensors, rejection hardware, lights, computing resources, issues and challenges to deploy the system etc. Assume suitable data in order to design the system.

Q.3 [B] **CLO 4, L3** Develop an algorithm flowchart to identify, locate and decode 1D barcodes from the image. Three numbers of 1D barcodes are present in the image. Justify the use of each method or step used in the algorithm. **[10]**