Nirma University
Institute of Technology
Semester End Examination (IR), December - 2021
B. Tech. in ME / EE / IC / EC / CSE, 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) State the parameters considered while selecting a computing hardware for a machine vision application.

b) Justify the statement. "Machine vision lights are used in strobe mode."

Q.1 [B] Discuss the vision camera trigger types and usage of each type with application. **[06]**

CLO 3, L2

Q.2 [A] Discuss the image segmentation operations in details. Also, mention the application of image segmentation. **[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.

91	87	94	34	30	33	35	39	92	88	95	90	89

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

Image data is given in below table.

202	200	199
203	103	205
204	201	197

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

Q.3 [A]
CLO 4, L6

Design a machine vision application to sort apples in different grades [14] based on size, color, and defects. Apple size may vary from 110 mm to 60 mm in diameter. System should be able to grade 20,000 apples per hour.

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 for defects. 6 tablets [14] are travelling in separate channels on a linear vibratory feeder. Width of the feeder is 280 mm. Speed of inspection required is 1800 tablets per minute.

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 measure linear dimensions (length and [10] width) of solid objects (square and rectangle). Justify the use of each method or step used in the algorithm.