K. J. Somaiya Institute of Engineering and Information Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)
End Semester Exam
Nov – Dec 2021
Program: B. Tech
Examination: LY Semester: VII
Course Code: 1UCEDLC7031 and Course Name: Computer Vision
Duration: 03 Hours Max. Marks: 60

Instructions:
(1) All questions are compulsory.
(2) Draw neat diagrams wherever applicable.
(3) Assume suitable data, if necessary.

		Max. Marks	CO	BT level
Q 1	**Solve any six questions out of eight:**	**12**		
i)	Explain any four research applications of computer vision	**2**	CO6	U
ii)	What kind of problems are solved by layered motion technique?	**2**	CO5	U
iii)	Compute city block and chessboard distance of the following image. Consider pixel p at location (4,0) and q at location (0,4) as shown in the image. 3 2 4 3 1q 0 4 4 3 2 2 2 2 0 2 2 2 1 1 1 1p 0 1 0 3	**2**	CO2	Ap
iv)	Explain active contour model in brief.	**2**	CO2	U
v)	What is line localization? Give a few applications of it.	**2**	CO3	U
vi)	What is brightness constancy constraint in translational alignment?	**2**	CO5	U
vii)	Define surface reflectance and surface irradiance.	**2**	CO4	U

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<tr><td>viii)</td><td>Write automatic global thresholding algorithm. In which condition it fails?</td><td>2</td><td>CO1</td><td>U</td></tr>
<tr><td>Q.2</td><td>Solve any four questions out of six.</td><td>16</td><td></td><td></td></tr>
<tr><td>i)</td><td>Explain how HFR is formulated as a dual generation problem, and tackle it via a novel Dual Variational Generation (DVG-Face) framework.</td><td>4</td><td>CO6</td><td>U</td></tr>
<tr><td>ii)</td><td>Which are second order derivative edge detectors. Apply it on the following image to non-border pixels only.
<table><tr><td>1</td><td>2</td><td>4</td><td>5</td><td>2</td></tr><tr><td>5</td><td>2</td><td>5</td><td>6</td><td>2</td></tr><tr><td>5</td><td>4</td><td>2</td><td>7</td><td>1</td></tr><tr><td>1</td><td>1</td><td>3</td><td>5</td><td>6</td></tr><tr><td>2</td><td>4</td><td>6</td><td>4</td><td>7</td></tr></table></td><td>4</td><td>CO1</td><td>Ap</td></tr>
<tr><td>iii)</td><td>What is focus measure in depth of focus algorithm. Which edge detectors are used in the computation of the focus measure? If focal length is 50 mm, then find scene depth with sensor locations of 50.25 mm, 51.20 mm and 51.40 mm.</td><td>4</td><td>CO5</td><td>Ap</td></tr>
<tr><td>iv)</td><td>Explain least square regression algorithm in detail.</td><td>4</td><td>CO3</td><td>U</td></tr>
<tr><td>v)</td><td>Explain shape from shading technique in 3D vision</td><td>4</td><td>CO4</td><td>U</td></tr>
<tr><td>vi)</td><td>Write sequential CCL algorithm and apply it on the following image.
<table><tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td><td>2</td><td>0</td><td>0</td><td>2</td><td>2</td><td>0</td></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td><td>2</td><td>0</td><td>0</td><td>2</td><td>2</td><td>0</td></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td><td>0</td></tr><tr><td>0</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td><td>0</td></tr><tr><td>0</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td><td>0</td></tr></table></td><td>4</td><td>CO2</td><td>Ap</td></tr>
<tr><td>Q.3</td><td>Solve any two questions out of three.</td><td>16</td><td></td><td></td></tr>
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i)	Explain surface, point and volumetric representations in detail.	8	CO4	U
ii)	For a million-scale face recognition problem, explain the steps in cleaning of the largest public face recognition 'WebFace260M' dataset. Also, explain an elaborately designed time-constrained evaluation protocol. Explain and analyze how Face Recognition Under Inference Time conStraint (FRUITS) protocol was constructed to solve this problem.	8	CO6	U
iii)	Explain RANSAC algorithm for straight line detection. Analyze and comment on: Which of the two, Hough transform and RANSAC is better in object tracking application and why?	8	CO3	An
Q.4	**Solve any two questions out of three.**	**16**		
i)	First structuring element(B1) used for the thinning operation is given below. Generate remaining seven structuring elements just by rotating the first element in a clockwise direction by one pixel. Apply thinning operation on the given image using these structuring elements. Perform only one iteration. 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 x 1 x 1 1 1 B¹	8	CO2	Ap
ii)	Explain in detail how a 3D point can be reconstructed from a 2D image using triangulation method	8	CO5	U
iii)	Compare Otsu method, Hysteresis thresholding and local thresholding considering the technique, advantages, and drawbacks parameters.	8	CO1	An