

# Faculty of Engineering

## End Semester Examination May 2025

### RA3CO46 Computer Vision

<b>Programme</b>	:	B.Tech.	<b>Branch/Specialisation</b>	:	RA
<b>Duration</b>	:	3 hours	<b>Maximum Marks</b>	:	60

**Note:** All questions are compulsory. Internal choices, if any, are indicated. Assume suitable data if necessary. Notations and symbols have their usual meaning.

#### Section 1 (Answer all question(s))

Q1.	The process of converting an analog image into a digital image is called-	Marks CO BL
	<input type="radio"/> Filtering <input checked="" type="radio"/> Digitization <input type="radio"/> Histogram equalization <input type="radio"/> Color transformation	1 1 1
Q2.	Which transformation enhances the contrast of an image?	1 1 1
	<input checked="" type="radio"/> Histogram equalization <input type="radio"/> Convolution <input type="radio"/> Fourier transform <input type="radio"/> Rigid transformation	
Q3.	Which of the following is a commonly used edge detection algorithm?	1 1 1
	<input checked="" type="radio"/> Sobel <input type="radio"/> Dijkstra <input type="radio"/> Backpropagation <input type="radio"/> Mean Shift	
Q4.	The key difference between SIFT and HOG descriptors is-	1 1 1
	<input type="radio"/> HOG is rotation-invariant, whereas SIFT is not <input checked="" type="radio"/> HOG is used for corner detection, while SIFT is used for segmentation <input type="radio"/> SIFT is computationally faster than HOG <input checked="" type="radio"/> SIFT is used for keypoint detection, while HOG is used for feature representation	
Q5.	Which of the following parameters define the intrinsic parameters of a camera?	1 1 1
	<input type="radio"/> Camera position and orientation <input checked="" type="radio"/> Focal length, principal point, skew, pixel size <input type="radio"/> World coordinates of objects <input type="radio"/> Rotation and translation matrices	
Q6.	The orthographic projection model assumes that-	1 1 1
	<input type="radio"/> Light rays pass through a single point <input checked="" type="radio"/> All rays are parallel to the image plane <input type="radio"/> Depth information is fully preserved <input type="radio"/> The camera has no lens distortion	
Q7.	Optical flow is used to estimate-	1 1 1
	<input type="radio"/> Depth information in a static image <input checked="" type="radio"/> Apparent motion of pixels between consecutive frames of an image or video sequence <input type="radio"/> Object color variations <input type="radio"/> Image segmentation boundaries	
Q8.	Lucas-Kanade optical flow method assumes-	1 1 1
	<input type="radio"/> Large motion displacements <input checked="" type="radio"/> Global smoothness constraint <input type="radio"/> Constant velocity over a local window <input type="radio"/> High computational complexity	
Q9.	Appearance-based methods rely primarily on-	1 1 1
	<input type="radio"/> Shape features <input checked="" type="radio"/> Texture patterns <input type="radio"/> Pixel intensity values <input type="radio"/> Edge detection	

**Q10.** Which of the following is an example of a geometric invariant?

1 1 1

- Pixel intensity
- Color histogram

- Texture gradient
- Euclidean distance between keypoints

### Section 2 (Answer all question(s))

Marks CO BL

**Q11.** An image is given with a value of  $R = 200$ ,  $G = 100$ ,  $B = 50$  in RGB Format. Calculate the values of HSI.

3 2 3

Rubric	Marks
Calculate the values of HSI.	3

**Q12. (a)** What is histogram processing? Write the names of different types of histogram processing. Explain histogram equalization with the help of an example.

7 3 2

Rubric	Marks
Explain histogram processing 2 marks, Write the names of different types of histogram processing 1 mark, Explain histogram Equalization with the help of an example. 4 marks	7

(OR)

**(b)** What is computer vision? Explain various key techniques of computer vision.

Rubric	Marks
What is computer vision 2 marks, Explain various key techniques of computer vision.5 marks	7

### Section 3 (Answer all question(s))

Marks CO BL

**Q13.** What are the key differences between edge-based segmentation and region-based segmentation?

3 2 2

Rubric	Marks
Write Three Differences	3

**Q14. (a)** Explain the Scale-Invariant Feature Transform (SIFT) and its advantages.

7 3 2

Rubric	Marks
Explain the Scale-Invariant Feature Transform (SIFT) 5 marks, Write its advantages.2 marks	7

(OR)

**(b)** Explain the working of any one edge detection algorithm with its five key steps.

Rubric	Marks
Write the working of the Canny Edge Detection Algorithm with its five key steps.	7

### Section 4 (Answer all question(s))

Marks CO BL

**Q15.** Write any three differences between pinhole and real-world camera models.

3 2 1

Rubric	Marks
Write any three differences	3

**Q16. (a)** Explain the perspective camera model and derive its projection matrix.

7 3 2

Rubric	Marks
Explain the perspective camera model 3 marks, derive its projection matrix. 4 marks	7

**(OR)**

**(b)** Explain intrinsic and extrinsic parameters of a camera.

Rubric	Marks
Explain intrinsic and extrinsic parameters of a camera.	7

### Section 5 (Answer all question(s))

Marks CO BL

3 2 2

**Q17.** What are the challenges in real-time motion tracking?

Rubric	Marks
Write challenges in real-time motion tracking	3

**Q18. (a)** Derive the optical flow constraint equation and explain its significance.

7 3 2

Rubric	Marks
Derive the optical flow constraint equation 5 marks, explain its significance. 2 marks	7

**(OR)**

**(b)** How does the Kalman filter work in motion tracking?

Rubric	Marks
Explain Kalman filter work in motion tracking	7

### Section 6 (Answer any 2 question(s))

Marks CO BL

5 3 2

**Q19.** Explain the characteristics of appearance-based methods.

Rubric	Marks
Write 5 characteristics	5

**Q20.** Write a detailed note on image eigen spaces and its use in object recognition.

5 3 2

Rubric	Marks
Write a detailed note	5

**Q21.** Explain various techniques used for alignment

5 3 2

Rubric	Marks
Explain various techniques	5

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