

# **SRM VALLIAMMAI ENGINEERING COLLEGE**

**(An Autonomous Institution)**  
SRM Nagar, Kattankulathur – 603 203

## **DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE**

### **QUESTION BANK**



### **VII SEMESTER**

### **PCS505 COMPUTER VISION**

**Regulation – 2023**

**Academic Year 2026 – 2027 (Odd Semester)**

*Prepared by*

**Ms.R.Vaishnavi / Assistant Professor (O.G), AI&DS**



# SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur – 603203.

DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

## QUESTION BANK



**SUBJECT : PCS505 COMPUTER VISION**

**SEM/YEAR : VII/IV**

### **UNIT- I: INTRODUCTION TO IMAGE FORMATION AND PROCESSING**

**Computer Vision - Geometric primitives and transformations - Photometric image formation - The digital camera - Point operators - Linear filtering - More neighborhood operators - Fourier transforms- Pyramids and wavelets - Geometric transformations - Global optimization.**

#### **PART-A**

| <b>Q. No.</b> | <b>Questions</b>                                                                                                                      | <b>BTL</b> | <b>Competence</b> |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------|------------|-------------------|
| 1.            | What is BRDF? State its properties.                                                                                                   | BTL1       | Remembering       |
| 2.            | List the different components of a Computer vision system.                                                                            | BTL2       | Understanding     |
| 3.            | Briefly describe the difference between diffuse reflection and specular reflection.                                                   | BTL1       | Remembering       |
| 4.            | Define F-number.                                                                                                                      | BTL2       | Understanding     |
| 5.            | Define shutter speed.                                                                                                                 | BTL2       | Understanding     |
| 6.            | Figure out how the focus distance and depth of field indicators on a lens are determined.                                             | BTL1       | Remembering       |
| 7.            | Define Adaptive Histogram Equalization technique.                                                                                     | BTL2       | Understanding     |
| 8.            | Discuss about separable filter.                                                                                                       | BTL1       | Remembering       |
| 9.            | List the filters frequently used for linear operations.                                                                               | BTL1       | Remembering       |
| 10.           | Write the kernel function of band pass filter.                                                                                        | BTL2       | Understanding     |
| 11.           | Write the suitable operators used for bandpass and steerable filters.                                                                 | BTL1       | Remembering       |
| 12.           | List out the most common morphological operators used in image processing.                                                            | BTL2       | Understanding     |
| 13.           | List out the Fourier transform pairs of some commonly occurring filters and signals.                                                  | BTL1       | Remembering       |
| 14.           | Define interpolation and decimation. Name the suitable filter used for these two operations.                                          | BTL1       | Remembering       |
| 15.           | Define pyramids.                                                                                                                      | BTL2       | Understanding     |
| 16.           | List out the different transformation techniques and their preserved properties.                                                      | BTL2       | Understanding     |
| 17.           | Define MIP mapping.                                                                                                                   | BTL2       | Understanding     |
| 18.           | What is Image Deblocking?                                                                                                             | BTL1       | Remembering       |
| 19.           | What are shadows? Differentiate umbra from penumbra.                                                                                  | BTL2       | Understanding     |
| 20.           | State the different limitations of a pinhole camera and explain how to overcome these limitations. Write a short note on thin lenses. | BTL1       | Remembering       |
| 21.           | Define convolution. How does convolution differ from correlation in image processing?                                                 | BTL1       | Remembering       |
| 22.           | What is gamma correction? Why is it used in digital image enhancement?                                                                | BTL1       | Remembering       |
| 23.           | Define homography. Mention one application of homography in computer vision.                                                          | BTL2       | Understanding     |

| <b>PART B</b>                                                                                                                                                                       |                                                                                                                                                                                     |            |            |                   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------|-------------------|
| <b>Q. No.</b>                                                                                                                                                                       | <b>Questions</b>                                                                                                                                                                    |            | <b>BTL</b> | <b>Competence</b> |
| 1                                                                                                                                                                                   | Explain the working principle of a digital camera with a neat block diagram and briefly discuss the sampling and aliasing process.                                                  | (16)       | BTL4       | Analyzing         |
| 2                                                                                                                                                                                   | Explain briefly the need for Fourier Transform and Wiener filtering technique in image processing.                                                                                  | (16)       | BTL4       | Analyzing         |
| 3                                                                                                                                                                                   | Write short notes on:<br>a) Point operators<br>b) Neighborhood operators                                                                                                            | (8)<br>(8) | BTL3       | Applying          |
| 4                                                                                                                                                                                   | Explain in detail the use of image pyramids and their implementation.                                                                                                               | (16)       | BTL4       | Analyzing         |
| 5                                                                                                                                                                                   | Explain the linear filtering techniques used in the image formation process.                                                                                                        | (16)       | BTL4       | Analyzing         |
| 6                                                                                                                                                                                   | Explain briefly the various geometric transformation techniques used in image processing.                                                                                           | (16)       | BTL4       | Analyzing         |
| 7                                                                                                                                                                                   | Discuss in detail the concept of global optimization.                                                                                                                               | (16)       | BTL4       | Analyzing         |
| 8                                                                                                                                                                                   | Discuss in detail the wavelet decomposition technique.                                                                                                                              | (16)       | BTL3       | Applying          |
| 9                                                                                                                                                                                   | Explain the Bidirectional Reflectance Distribution Function (BRDF) in detail. Discuss its mathematical model, properties, and significance in photometric image formation.          | (16)       | BTL4       | Analyzing         |
| 10                                                                                                                                                                                  | Describe the complete architecture of a Computer Vision system with a neat block diagram. Explain the function of each component with suitable examples.                            | (16)       | BTL6       | Creating          |
| 11                                                                                                                                                                                  | Discuss the image enhancement techniques based on histogram processing. Explain Histogram Equalization and Adaptive Histogram Equalization with suitable examples and applications. | (16)       | BTL4       | Analyzing         |
| 12                                                                                                                                                                                  | Explain the design and implementation of separable filters. Compare separable and non-separable filters with respect to computational complexity and performance.                   | (16)       | BTL4       | Analyzing         |
| 13                                                                                                                                                                                  | Describe the different types of frequency domain filters. Explain Low-pass, High-pass, Band-pass, and Band-stop filters with their kernel functions and applications.               | (16)       | BTL6       | Creating          |
| 14                                                                                                                                                                                  | Explain morphological image processing in detail. Discuss the operations of erosion, dilation, opening, closing, and morphological gradient with suitable examples.                 | (16)       | BTL4       | Analyzing         |
| 15                                                                                                                                                                                  | Discuss the concepts of interpolation and decimation in image processing. Explain various interpolation techniques and the role of anti-aliasing filters in image scaling.          | (16)       | BTL4       | Analyzing         |
| 16                                                                                                                                                                                  | Explain MIP mapping in detail. Discuss its working principle, advantages, limitations, and applications in texture mapping and computer graphics.                                   | (16)       | BTL4       | Analyzing         |
| 17                                                                                                                                                                                  | Explain the concept of image deblocking. Discuss the causes of blocking artifacts, various deblocking techniques, and their applications in image and video compression.            | (16)       | BTL4       | Analyzing         |
| <b>UNIT II FEATURE DETECTION, MATCHING AND SEGMENTATION</b>                                                                                                                         |                                                                                                                                                                                     |            |            |                   |
| <b>Points and patches - Edges - Lines - Segmentation - Active contours - Split and merge - Mean shift and mode finding - Normalized cuts - Graph cuts and energy-based methods.</b> |                                                                                                                                                                                     |            |            |                   |
| <b>PART- A</b>                                                                                                                                                                      |                                                                                                                                                                                     |            |            |                   |
| <b>Q. No.</b>                                                                                                                                                                       | <b>Questions</b>                                                                                                                                                                    |            | <b>BTL</b> | <b>Competence</b> |
| 1                                                                                                                                                                                   | Define Image Gradient.                                                                                                                                                              |            | BTL1       | Remembering       |
| 2                                                                                                                                                                                   | What is Whitening?                                                                                                                                                                  |            | BTL1       | Remembering       |

|    |                                                                             |      |               |
|----|-----------------------------------------------------------------------------|------|---------------|
| 3  | Give the significance of Vanishing points in line detection process.        | BTL2 | Understanding |
| 4  | State Snakes.                                                               | BTL1 | Remembering   |
| 5  | Define catchment basins.                                                    | BTL2 | Understanding |
| 6  | What is adaptive non-maximal suppression?                                   | BTL2 | Understanding |
| 7  | What is multi-scale oriented patches?                                       | BTL2 | Understanding |
| 8  | What is affine invariance?                                                  | BTL1 | Remembering   |
| 9  | Write the gradient equation to define the slope and direction of a surface. | BTL2 | Understanding |
| 10 | What is line simplification?                                                | BTL2 | Understanding |
| 11 | Define corner detection.                                                    | BTL1 | Remembering   |
| 12 | What is the purpose of the Harris Corner Detector?                          | BTL2 | Understanding |
| 13 | Differentiate edge detection and corner detection.                          | BTL1 | Remembering   |
| 14 | Define the Canny edge detector. Mention its advantages.                     | BTL1 | Remembering   |
| 15 | What is the Hough Transform?                                                | BTL2 | Understanding |
| 16 | What is threshold-based image segmentation?                                 | BTL2 | Understanding |
| 17 | Define region growing in image segmentation.                                | BTL1 | Remembering   |
| 18 | What is the split-and-merge segmentation algorithm?                         | BTL1 | Remembering   |
| 19 | Define Mean Shift clustering.                                               | BTL2 | Understanding |
| 20 | What is mode seeking in Mean Shift?                                         | BTL1 | Remembering   |
| 21 | What are Normalized Cuts? State their objective.                            | BTL2 | Understanding |
| 22 | Define Graph Cut segmentation.                                              | BTL1 | Remembering   |
| 23 | What is an energy function in Graph Cut optimization?                       | BTL1 | Remembering   |
| 24 | Differentiate supervised and unsupervised image segmentation.               | BTL1 | Remembering   |

| Q. No. | PART– B                                                                                                                                           |            | BTL  | Competence |
|--------|---------------------------------------------------------------------------------------------------------------------------------------------------|------------|------|------------|
| 1      | Write Short note on<br>a) Feature detectors<br>b) Feature descriptors                                                                             | (8)<br>(8) | BTL3 | Applying   |
| 2      | Write Short note on<br>a) Feature Matching<br>b) Feature Tracking                                                                                 | (8)<br>(8) | BTL3 | Applying   |
| 3      | Explain about Edge detection and Edge linking process in detail.                                                                                  | (16)       | BTL4 | Analyzing  |
| 4      | Discuss about Successive approximation and Hough transform line detectors in detail                                                               | (16)       | BTL5 | Evaluating |
| 5      | Explain briefly about Active contour based segmentation.                                                                                          | (16)       | BTL4 | Analyzing  |
| 6      | Outline the concept of split and merge image segmentation techniques with neat diagram.                                                           | (16)       | BTL3 | Applying   |
| 7      | Briefly explain about mean shift and mode findings                                                                                                | (16)       | BTL4 | Analyzing  |
| 8      | Discuss in detail about Normalized cut segmentation techniques.                                                                                   | (16)       | BTL5 | Evaluating |
| 9      | Explain in detail about graph cuts and energy based segmentation models                                                                           | (16)       | BTL4 | Analyzing  |
| 10     | Explain the Scale-Invariant Feature Transform (SIFT) algorithm in detail. Discuss its feature detection, descriptor generation, and applications. | (16)       | BTL4 | Analyzing  |
| 11     | Describe the Speeded-Up Robust Features (SURF) algorithm. Compare SURF with SIFT in terms of speed, robustness, and performance.                  | (16)       | BTL4 | Analyzing  |
| 12     | Discuss the watershed segmentation algorithm in detail. Explain its working principle, advantages, limitations, and applications in               | (16)       | BTL5 | Evaluating |

|    |                                                                                                                                                                                                                   |      |      |            |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------------|
|    | image segmentation.                                                                                                                                                                                               |      |      |            |
| 13 | Explain the Canny edge detection algorithm with a neat flowchart. Discuss each stage involved in obtaining accurate edge maps.                                                                                    | (16) | BTL4 | Analyzing  |
| 14 | Describe the Lucas–Kanade feature tracking algorithm in detail. Explain its assumptions, mathematical formulation, advantages, and applications.                                                                  | (16) | BTL6 | Analyzing  |
| 15 | Explain the Random Sample Consensus (RANSAC) algorithm for robust feature matching. Discuss its working, advantages, limitations, and applications in computer vision.                                            | (16) | BTL4 | Applying   |
| 16 | Compare region-based, edge-based, and graph-based image segmentation techniques. Discuss their working principles, advantages, limitations, and suitable applications with examples.                              | (16) | BTL5 | Evaluating |
| 17 | Explain the template matching technique in detail. Discuss the working principle, similarity measures (SSD, SAD, and Normalized Cross-Correlation), advantages, limitations, and applications in computer vision. | (16) | BTL4 | Analyzing  |

### UNIT III FEATURE-BASED ALIGNMENT & MOTION ESTIMATION

**2D and 3D feature-based alignment - Pose estimation - Geometric intrinsic calibration - Triangulation- Two-frame structure from motion - Factorization - Bundle adjustment - Constrained structure and motion - Translational alignment - Parametric motion - Spline-based motion - Optical flow - Layered motion.**

#### PART A

| Q. No. | Questions                                                                       | BTL  | Competence    |
|--------|---------------------------------------------------------------------------------|------|---------------|
| 1      | What is video stabilization?                                                    | BTL2 | Remembering   |
| 2      | What is De-interlacing?                                                         | BTL2 | Understanding |
| 3      | Define optic flow.                                                              | BTL2 | Understanding |
| 4      | What is meant by a pose?                                                        | BTL2 | Understanding |
| 5      | What could cause uncorrelated estimates of pose? How can this issue be handled? | BTL2 | Understanding |
| 6      | Differentiate pose consistency and pose clustering.                             | BTL2 | Understanding |
| 7      | List the global parametrics transforms with matrix for 2D and 3D alignments.    | BTL1 | Remembering   |
| 8      | What is panography?                                                             | BTL1 | Remembering   |
| 9      | Define RANSAC.                                                                  | BTL1 | Remembering   |
| 10     | Justify how PROSAC is differ from RANSAC.                                       | BTL1 | Remembering   |
| 11     | Define radial motion.                                                           | BTL1 | Remembering   |
| 12     | Define radial distortion.                                                       | BTL2 | Understanding |
| 13     | Define triangulation.                                                           | BTL2 | Understanding |
| 14     | Define morphing.                                                                | BTL2 | Understanding |
| 15     | Compare projective and perspective factorization.                               | BTL1 | Remembering   |
| 16     | Define bundle adjustment.                                                       | BTL2 | Understanding |
| 17     | Write mathematical equation for SSD.                                            | BTL1 | Remembering   |
| 18     | List some correlation algorithm for dense motion estimation.                    | BTL1 | Remembering   |
| 19     | Define camera intrinsic calibration.                                            | BTL1 | Remembering   |
| 20     | What is Structure from Motion (SfM)?                                            | BTL1 | Remembering   |
| 21     | Differentiate sparse optical flow and dense optical flow.                       | BTL2 | Understanding |
| 22     | What is translational alignment? State its significance in image registration.  | BTL2 | Understanding |
| 23     | Define spline-based motion. Mention one application.                            | BTL1 | Remembering   |
| 24     | What is layered motion? State its advantages in motion analysis.                | BTL1 | Remembering   |

| <b>PART B</b> |                                                                                                                                                                                                                     |            |            |                   |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------|-------------------|
| <b>Q. No.</b> | <b>Questions</b>                                                                                                                                                                                                    |            | <b>BTL</b> | <b>Competence</b> |
| 1             | Discuss in detail about triangulation and two frame structure of motion.                                                                                                                                            | (16)       | BTL5       | Evaluating        |
| 2             | Discuss in detail about the following feature based alignment techniques.<br>i) Bundle adjustment techniques.<br>ii) Constrained structure and motion.                                                              | (8)<br>(8) | BTL5       | Evaluating        |
| 3             | Explain in detail about the following Motion based alignment techniques.<br>i) Translational motion.<br>ii) Parametric motion.                                                                                      | (8)<br>(8) | BTL4       | Analyzing         |
| 4             | Explain in detail about the following Motion based alignment techniques.<br>i) Spline and layered motion.<br>ii) Optical flow motion.                                                                               | (8)<br>(8) | BTL4       | Analyzing         |
| 5             | Explain in detail about linear and iterative algorithms used for pose estimation.                                                                                                                                   | (16)       | BTL4       | Analyzing         |
| 6             | 6 Explain briefly about the various techniques used in geomentric intrinsic calibration.                                                                                                                            | (16)       | BTL4       | Analyzing         |
| 7             | Discuss in detail about the following feature based alignment techniques.<br>i) Trinangulation techniques.<br>ii) Factorization techniques.                                                                         | (8)<br>(8) | BTL5       | Evaluating        |
| 8             | Explain in detail about layered motion technique used for motion estimation.                                                                                                                                        | (16)       | BTL4       | Analyzing         |
| 9             | Explain the complete pipeline of 2D and 3D feature-based alignment. Discuss feature detection, matching, transformation estimation, and image alignment with suitable examples.                                     | (16)       | BTL6       | Creating          |
| 10            | Discuss the concept of camera pose estimation in detail. Explain the Perspective-n-Point (PnP) problem and the methods used to estimate camera pose.                                                                | (16)       | BTL4       | Analyzing         |
| 11            | Explain the Random Sample Consensus (RANSAC) and Progressive Sample Consensus (PROSAC) algorithms for robust geometric model estimation. Compare their working principles, advantages, and limitations.             | (16)       | BTL4       | Analyzing         |
| 12            | Discuss the different global parametric transformation models used for image alignment. Explain translation, Euclidean, similarity, affine, and projective transformations with their mathematical representations. | (16)       | BTL5       | Evaluating        |
| 13            | Explain video stabilization techniques in detail. Discuss camera motion estimation, motion smoothing, image warping, and frame reconstruction with suitable illustrations.                                          | (16)       | BTL4       | Analyzing         |
| 14            | Explain the dense motion estimation process using correlation-based methods. Discuss SSD, SAD, Normalized Cross-Correlation (NCC), and their applications in motion estimation.                                     | (16)       | BTL4       | Analyzing         |
| 15            | Discuss radial motion and radial distortion in detail. Explain their causes, mathematical models, distortion correction techniques, and practical applications in camera calibration.                               | (16)       | BTL5       | Evaluating        |
| 16            | Explain image morphing in detail. Discuss the stages of feature correspondence, image warping, interpolation, and cross-dissolving with suitable examples and applications.                                         | (16)       | BTL4       | Analyzing         |

| 17                                                                                                                                                                                         | Explain the complete Structure from Motion (SfM) pipeline in detail. Discuss feature detection and matching, camera motion estimation, triangulation, bundle adjustment, and 3D scene reconstruction with a neat block diagram. | (16)       | BTL4       | Analyzing         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------|-------------------|
| <b>UNIT IV 3D RECONSTRUCTION</b>                                                                                                                                                           |                                                                                                                                                                                                                                 |            |            |                   |
| Shape from X - Active range finding - Surface representations - Point-based representations-Volumetric representations - Model-based reconstruction - Recovering texture maps and albedos. |                                                                                                                                                                                                                                 |            |            |                   |
| <b>PART A</b>                                                                                                                                                                              |                                                                                                                                                                                                                                 |            |            |                   |
| <b>Q. No.</b>                                                                                                                                                                              | <b>Questions</b>                                                                                                                                                                                                                |            | <b>BTL</b> | <b>Competence</b> |
| 1                                                                                                                                                                                          | Define the term “shape from shading”.                                                                                                                                                                                           |            | BTL2       | Understanding     |
| 2                                                                                                                                                                                          | Compare BRDF and SVBRDF.                                                                                                                                                                                                        |            | BTL1       | Remembering       |
| 3                                                                                                                                                                                          | What is an implicit surface?                                                                                                                                                                                                    |            | BTL2       | Understanding     |
| 4                                                                                                                                                                                          | Write about point based representation in 3D image reconstruction.                                                                                                                                                              |            | BTL2       | Understanding     |
| 5                                                                                                                                                                                          | Define radiational filters.                                                                                                                                                                                                     |            | BTL1       | Remembering       |
| 6                                                                                                                                                                                          | Define active range findings.                                                                                                                                                                                                   |            | BTL1       | Remembering       |
| 7                                                                                                                                                                                          | What are distance measures? State any two properties of a similarity measure.                                                                                                                                                   |            | BTL1       | Remembering       |
| 8                                                                                                                                                                                          | Mention any two examples for dissimilarity measures, with equations.                                                                                                                                                            |            | BTL1       | Remembering       |
| 9                                                                                                                                                                                          | Define scattered data interpolation.                                                                                                                                                                                            |            | BTL2       | Understanding     |
| 10                                                                                                                                                                                         | Write difference between back ground subtraction and difference matting?                                                                                                                                                        |            | BTL2       | Understanding     |
| 11                                                                                                                                                                                         | Define shadow striping.                                                                                                                                                                                                         |            | BTL1       | Remembering       |
| 12                                                                                                                                                                                         | Define range data registration.                                                                                                                                                                                                 |            | BTL1       | Remembering       |
| 13                                                                                                                                                                                         | Define range data merging.                                                                                                                                                                                                      |            | BTL2       | Understanding     |
| 14                                                                                                                                                                                         | Define Shape from Stereo.                                                                                                                                                                                                       |            | BTL2       | Understanding     |
| 15                                                                                                                                                                                         | What is Shape from Silhouette?                                                                                                                                                                                                  |            | BTL1       | Remembering       |
| 16                                                                                                                                                                                         | Define volumetric representation.                                                                                                                                                                                               |            | BTL2       | Understanding     |
| 17                                                                                                                                                                                         | Differentiate explicit and implicit surface representations.                                                                                                                                                                    |            | BTL2       | Understanding     |
| 18                                                                                                                                                                                         | What is model-based 3D reconstruction?                                                                                                                                                                                          |            | BTL2       | Understanding     |
| 19                                                                                                                                                                                         | Define texture mapping. State its purpose in 3D reconstruction.                                                                                                                                                                 |            | BTL1       | Remembering       |
| 20                                                                                                                                                                                         | What is albedo? How does it differ from surface reflectance?                                                                                                                                                                    |            | BTL2       | Understanding     |
| 21                                                                                                                                                                                         | Define voxel. Mention one advantage of voxel-based representation.                                                                                                                                                              |            | BTL2       | Understanding     |
| 22                                                                                                                                                                                         | What is laser triangulation in active range finding?                                                                                                                                                                            |            | BTL2       | Understanding     |
| 23                                                                                                                                                                                         | What is Time-of-Flight (ToF) range sensing? State one application.                                                                                                                                                              |            | BTL1       | Remembering       |
| 24                                                                                                                                                                                         | Define occupancy grid. State its role in volumetric 3D reconstruction.                                                                                                                                                          |            | BTL1       | Remembering       |
| <b>PART B</b>                                                                                                                                                                              |                                                                                                                                                                                                                                 |            |            |                   |
| <b>Q. No.</b>                                                                                                                                                                              | <b>Questions</b>                                                                                                                                                                                                                |            | <b>BTL</b> | <b>Competence</b> |
| 1                                                                                                                                                                                          | Explain in detail about the various shape extraction techniques used in 3D image reconstruction process.                                                                                                                        | (16)       | BTL4       | Analyzing         |
| 2                                                                                                                                                                                          | Explain in detail about the surface and point based representation techniques used in 3D reconstruction process.                                                                                                                | (16)       | BTL4       | Analyzing         |
| 3                                                                                                                                                                                          | Explain in the concept of model based 3D reconstruction process in detail.                                                                                                                                                      | (16)       | BTL4       | Analyzing         |
| 4                                                                                                                                                                                          | Explain in detail about the following 3D reconstruction techniques.<br>i) Volumetric representation.<br>Active range findings.                                                                                                  | (8)<br>(8) | BTL4       | Analyzing         |
| 5                                                                                                                                                                                          | Explain in detail about how to recover texture maps and albedos during the image reconstruction process.                                                                                                                        | (16)       | BTL4       | Analyzing         |
| 6                                                                                                                                                                                          | Explain the concept of Shape from Shading in detail. Discuss its assumptions, mathematical formulation, advantages, limitations, and                                                                                            | (16)       | BTL4       | Analyzing         |

|    |                                                                                                                                                                                              |      |      |            |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------------|
|    | applications in 3D reconstruction.                                                                                                                                                           |      |      |            |
| 7  | Discuss the various Shape from X techniques used for 3D reconstruction. Compare Shape from Shading, Shape from Stereo, Shape from Silhouette, and Shape from Texture with suitable examples. | (16) | BTL5 | Evaluating |
| 8  | Explain the working principle of active range finding techniques. Discuss laser triangulation, structured light, and Time-of-Flight (ToF) methods with neat diagrams.                        | (16) | BTL4 | Analyzing  |
| 9  | Describe the different surface representation techniques used in computer vision. Compare mesh, parametric, and implicit surface representations with their advantages and applications.     | (16) | BTL4 | Analyzing  |
| 10 | Discuss point cloud generation and point-based surface reconstruction techniques. Explain their advantages, limitations, and applications in 3D modeling.                                    | (16) | BTL5 | Evaluating |
| 11 | Explain implicit surface representation in detail. Discuss level-set methods, signed distance functions, and their applications in 3D image reconstruction.                                  | (16) | BTL4 | Analyzing  |
| 12 | Discuss distance measures and similarity measures used in 3D reconstruction. Explain their mathematical properties and significance in range data processing.                                | (16) | BTL5 | Evaluating |
| 13 | Explain range data registration techniques in detail. Discuss feature-based and Iterative Closest Point (ICP) registration methods with suitable illustrations.                              | (16) | BTL4 | Analyzing  |
| 14 | Discuss range data merging techniques in detail. Explain the challenges involved in integrating multiple range scans to obtain a complete 3D model.                                          | (16) | BTL5 | Evaluating |
| 15 | Explain scattered data interpolation techniques used in surface reconstruction. Discuss their mathematical principles and practical applications.                                            | (16) | BTL4 | Analyzing  |
| 16 | Compare background subtraction and difference matting techniques. Explain their working principles, advantages, limitations, and applications in scene reconstruction.                       | (16) | BTL6 | Creating   |
| 17 | Discuss shadow striping techniques in active range sensing. Explain the principle, implementation, advantages, and limitations with suitable diagrams.                                       | (16) | BTL5 | Evaluating |

#### UNIT V

View interpolation Layered depth images - Light fields and Lumigraphs - Environment mattes - Video-based rendering-Object detection - Face recognition - Instance recognition - Category recognition - Context and scene understanding- Recognition databases and test sets.

#### PART A

| Q. No. | Questions                                                | BTL  | Competence    |
|--------|----------------------------------------------------------|------|---------------|
| 1      | Define sprites and layers.                               | BTL1 | Remembering   |
| 2      | What is a video texture?                                 | BTL1 | Remembering   |
| 3      | Define SVM?                                              | BTL2 | Understanding |
| 4      | Define view interpolation.                               | BTL2 | Understanding |
| 5      | Write about photo tourism.                               | BTL2 | Understanding |
| 6      | Draw the layered depth map images.                       | BTL2 | Understanding |
| 7      | Write about light fields and lumigraphs.                 | BTL2 | Understanding |
| 8      | What is unstructured lumigraphs?                         | BTL2 | Understanding |
| 9      | Define concentric mosaics.                               | BTL1 | Remembering   |
| 10     | Draw the environment mattes representation.              | BTL2 | Understanding |
| 11     | Compare videobased rendering with video based animation. | BTL2 | Understanding |
| 12     | Define triphones.                                        | BTL2 | Understanding |

|    |                                                                                                |      |               |
|----|------------------------------------------------------------------------------------------------|------|---------------|
| 13 | What is free viewpoint video?                                                                  | BTL1 | Remembering   |
| 14 | Define map correlation.                                                                        | BTL1 | Remembering   |
| 15 | Define Clustering.                                                                             | BTL2 | Understanding |
| 16 | Define PCA.                                                                                    | BTL2 | Understanding |
| 17 | What is boosting?                                                                              | BTL1 | Remembering   |
| 18 | Define decision stumps.                                                                        | BTL1 | Remembering   |
| 19 | Define HOG.                                                                                    | BTL1 | Remembering   |
| 20 | Define Eigen faces.                                                                            | BTL2 | Understanding |
| 21 | Define Principal Component Analysis (PCA). State its role in face recognition.                 | BTL1 | Remembering   |
| 22 | What is context-based scene understanding?                                                     | BTL1 | Remembering   |
| 23 | Differentiate instance recognition and category recognition.                                   | BTL1 | Remembering   |
| 24 | What is a recognition database? State its importance in evaluating computer vision algorithms. | BTL1 | Remembering   |

### PART B

| Q. No. | Questions                                                                                                                                                                |            | BTL  | Competence |
|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------|------------|
| 1      | Explain in detail about the following concepts in image based rendering process.<br>i) Layered depth images.<br>ii) Light fields and lumigraphs.                         | (8)<br>(8) | BTL4 | Analyzing  |
| 2      | Explain in detail about environment mattes techniques used in image rendering process.                                                                                   | (16)       | BTL4 | Analyzing  |
| 3      | Explain in detail about the following concepts in image based rendering process.<br>i) View interpolation<br>ii) Light fields and lumigraphs.                            | (8)<br>(8) | BTL4 | Analyzing  |
| 4      | Explain various concepts used in video based rendering process.                                                                                                          | (16)       | BTL4 | Analyzing  |
| 5      | Explain in detail about Face recognition technique with necessary diagrams.                                                                                              | (16)       | BTL4 | Analyzing  |
| 6      | Explain in detail about Instance recognition technique with necessary diagrams.                                                                                          | (16)       | BTL4 | Analyzing  |
| 7      | Explain in detail about Category recognition technique with necessary diagrams.                                                                                          | (16)       | BTL4 | Analyzing  |
| 8      | Discuss in detail about the concept of Context and scene understanding.                                                                                                  | (16)       | BTL6 | Creating   |
| 9      | Explain the concept of image-based rendering in detail. Discuss its principles, advantages, limitations, and applications in computer vision.                            | (16)       | BTL4 | Analyzing  |
| 10     | Describe the architecture of a video-based rendering system. Explain the complete rendering pipeline with a neat block diagram.                                          | (16)       | BTL5 | Evaluating |
| 11     | Explain video textures in detail. Discuss their generation process, properties, advantages, and applications in computer graphics and vision.                            | (16)       | BTL4 | Analyzing  |
| 12     | Discuss the concept of sprites and layers in image-based rendering. Explain their representation, rendering process, advantages, and applications.                       | (16)       | BTL5 | Evaluating |
| 13     | Explain unstructured lumigraphs in detail. Compare structured and unstructured lumigraph representations with suitable examples.                                         | (16)       | BTL5 | Evaluating |
| 14     | Describe concentric mosaics in detail. Explain their construction, working principle, advantages, limitations, and applications.                                         | (16)       | BTL6 | Creating   |
| 15     | Discuss object detection techniques in detail. Explain the role of feature extraction, HOG descriptors, SVM classifiers, and boosting algorithms with suitable examples. | (16)       | BTL4 | Analyzing  |

|    |                                                                                                                                                                                            |      |      |            |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------------|
| 16 | Explain Histogram of Oriented Gradients (HOG) in detail. Discuss its feature extraction process and its application in object detection.                                                   | (16) | BTL5 | Evaluating |
| 17 | Discuss Support Vector Machine (SVM) as a classification technique in computer vision. Explain its working principle, kernel functions, advantages, and applications in image recognition. | (16) | BTL6 | Creating   |

