UNIT I

PART A

1. Write the differences between photopic and scotopic vision?
2. What is mach band effect?
3. Write the properties of cosine transform
4. Write the properties of KL transform
5. Define SVD.
7. Define Hue and saturation.
8. Justify that KLT is an optimal transform.
9. Give the Conditions for perfect transform?
10. Give two properties of SVD transform?
12. Define Histogram? What is histogram Equalization (or) histogram Linearization?
13. What are drawbacks of histogram equalization?
15. What is contrast stretching?
16. What is image negative?
17. What is bit plane slicing?
18. Why noise is always considered to be additive in images?
19. Define Dilation and erosion
20. Define Morphology

PART B

1. Describe the elements of visual perception. (16)
2. (i) Explain and the properties of 2D Fourier Transform. (8)
   (ii) Explain singular value decomposition and specify its properties. (8)
3. Explain discrete cosine transform and specify its properties. (16)
4. Find DCT Transform and its inverse for the given 2 x 2 image \([3 \ 6; \ 6 \ 4]\). (16)
5. Obtain forward KL transform for the given vectors.
   \(X_1=[1 \ 0 \ 0]; \ X_2=[1 \ 0 \ 1]; \ X_3=[1 \ 1 \ 0]\) (Transpose these vectors) and analyze how the principal components are used for remote sensing applications? (16)
6. Determine convolution of the given array
   \[f(x,y) = \begin{bmatrix} 1 & 2 & 1 \\ 5 & 3 & \end{bmatrix} \quad h(x,y) = \begin{bmatrix} 1 & \ \ \\ 1 & -1 \end{bmatrix}\] (16)
7. (i) Write notes on Homomorphic filtering (8)
   (ii) Explain K-L transform in detail. (8)
9. Describe Image enhancement in spatial and frequency domain. (16)
10. Obtain Histogram and Histogram equalization for a given image (4 x 4) – 4 bit per pixel is given by
    \[
    \begin{bmatrix}
    10 & 12 & 8 & 9 \\
    10 & 12 & 12 & 14 \\
    12 & 13 & 10 & 9 \\
    14 & 12 & 10 & 12 \\
    \end{bmatrix}
    \] (16)

UNIT II

PART A

1. Name the different types of derivative filters?
2. What are the 2 principles steps involved in marker selection?
3. What is segmentation?
4. What are the three types of discontinuity in digital image?
5. What is global, Local and dynamic or adaptive threshold?
6. Define region growing?
7. Define region splitting and merging
8. What is meant by markers?
9. What are the various methods of thresholding in image segmentation?
10. Define catchment basin.
11. Write sobel horizontal and vertical edge detection masks (or) Define sobel operator
12. How do you know that an image is getting over segmented?
13. What are the two general approaches to performing texture segmentation
14. What are the advantages and disadvantages of region based approach of texture feature based segmentation.
15. Define clustering.
16. What are the limitations of snake based active contour model.
17. What are the advantages of level set based active contour model.
18. What are the advantages and disadvantages of atlas based segmentation.
19. What are the applications of atlas based segmentation.
20. What are the applications of active contour based segmentation.

**PART B**

1. Discuss how
   (i) Region growing (8)
   (ii) Region splitting and merging approaches are used for image segmentation (8)
2. Describe in detail about segmentation by morphological watersheds. (16)
3. Discuss in detail about the threshold based segmentation. (16)
4. Explain the texture feature based segmentation. (16)
5. Explain the methods of model based segmentation. (16)
6. Explain the wavelet based segmentation. (16)
7. Explain the atlas based segmentation. (16)
8. Explain the snake based active contour model segmentation. (16)
9. Explain the fuzzy clustering based segmentation. (16)
10. Explain the level set based active contour model segmentation. (16)

**UNIT III**

**PART A**

1. What are the advantages of canny edge detection?
2. What are the advantages and disadvantages of laplacian operator?
3. Define edge magnitude and direction of Prewitt operator.
5. Define phase congruency.
6. What are the advantages of Hough transform.
7. Define polar HT for lines.
8. What are the advantages polar HT for lines.
9. Define Hough transform for ellipses
10. Define distance weighting function of discrete symmetry operator
11. Define direction and phase weighting function of discrete symmetry operator
12. Define descriptors.
14. What are the advantages of Fourier descriptors?
15. Define region descriptors.
16. Define compactness
17. Define irregularity.
18. Define invariance moments
19. Define gabor filter
20. Define fractal dimension

PART B

1. Explain second order edge detection operators. (16)
2. Explain Sobel and Canny edge detection operators. (16)
3. Explain feature extraction using Phase congruency. (16)
4. Explain the feature extraction using different Hough transform techniques. (16)
5. How to estimate and analyze the image curvature. (16)
6. Explain the type of shape skeletonization. (16)
7. (i) Explain chain code. (8)
     (ii) Explain Fourier descriptor. (8)
8. (i) Explain the region descriptors for feature extraction. (8)
     (ii) Explain the texture description of image analysis. (8)
9. Explain the Fractal model based feature extraction. (16)
10. Explain Gabor filter and wavelet features for the classification of images. (16)

UNIT IV

PART A

1. What are the steps to follow the image registration?
2. Define image registration.
3. Define inverse filter. What are the uses?
4. Define cornerness measure.
5. Define Hausdorff distance
6. What is the principle to relate the points in sensed and references images?
7. Define Projective transformation.
8. What are the uses of Invariant moments?
9. Define relaxation labeling
10. Define shape matrices.
11. Define Image fusion
12. Define multisensor fusion
13. What are the potential advantages of image fusion?
14. What are the applications of image fusion?
15. What are the methods of image fusion?
16. What are multiscale decomposition methods?
17. What are non multiscale decomposition methods?
18. Define overall cross entropy.
20. Define mutual information.

**PART B**

1. (i) Explain the feature points to determine the parameters of a transformation function that registers the images. (8)
   (ii) Explain the feature lines to determine the parameters of a transformation function that registers the images. (8)
2. (i) Explain the steps in image registration. (8)
   (ii) Write the Matching using scene coherence algorithm to find the correspondence between the points of sensed and reference images. (8)
3. (i) Explain the algorithm to find the correspondence between the lines of sensed and reference images. (8)
   (ii) Explain the region by shape matching to find the correspondence between sensed and reference images. (8)
4. (i) Explain the region matching by relaxation labeling to find the correspondence between sensed and reference images. (8)
   (ii) Write the algorithm to find the correspondence between the lines of sensed and reference images. (8)
5. Explain the template matching using similarity measures to find the correspondence between sensed and reference images. (8)
6. (i) Explain the methods for determining a transformation function for mapping to sensed image to reference images. (8)
   (ii) Explain the methods for sensed image is point-by-point resampled to the geometry of the reference image. (8)
7. (i) Explain the Multiscale decomposition –based fusion methods. (8)
   (ii) Explain the Nonmultiscale decomposition –based fusion methods. (8)
8. (i) Explain the performance evaluation of objective evaluation measures with reference image. (8)
   (ii) Explain the performance evaluation of objective evaluation measures with not requiring a reference image. (8)
9. Explain Multiresolution based fusion using discrete wavelet transform and curvelet transform. (16)
10. (i) Explain Region based fusion (8)
    (ii) Explain hybrid image registration of image fusion. (8)
UNIT V

PART A

1. Define absorption rule
2. Define Voxel.
3. What are the difference between pixel and voxel.
4. How to store 3D data sets
5. How to obtain 3D data sets by different imaging techniques.
6. What is the use of slicing the data set?
7. What is the use of Color?
8. What are the advantages and disadvantages of volumetric display?
9. How to construct stereo views of image?
10. Define ray tracing.
11. What is the use of reflection of 3D images?
12. Define Dull surface.
14. Write about feature specific improvement.
15. Name the various sources of 3D data and how is the 3D image represented?
16. What are the surfaces of 3D image visualization?
17. What are the reflection of 3D image visualization
18. Define volumetric display.
19. What are the classifications of measurements on 3D images?
20. How to determine the position of features in 3D images?

PART B

1. Explain the image processing in 3D. (16)
2. Explain the slicing and data sets of 3D image visualization. (16)
3. Explain arbitrary section planes. (16)
4. Explain volumetric display of 3D image visualization. (16)
5. Explain Ray tracing. (16)
6. Explain surfaces of 3D image visualization. (16)
7. Explain reflection of 3D image visualization. (16)
8. Explain measurements on 3D images. (16)
9. Explain multiply connected surfaces of 3D image visualization. (16)
10. Explain stereo viewing of 3D image visualization. (16)