1. Explain how contra harmonic filter generalizes the other order-statistic filters.
2. Define image gradient and explain how it is useful for edge detection.
3. Explain how Laplacian of Gaussian deals with the noise during segmentation.
4. Derive the threshold required in segmentation using Global thresholding technique.
5. Explain the region growing algorithm for the segmentation of an image. 763
6. Define the morphological operation and explain the following: (i) Erosion, (ii) Dilation.
7. Derive the sequence of application of Opening and Closing operations involved in the detection of a particular binary pattern in fixed orientation. Hint: Pixels which you Hit are the shape pixels and which you Miss are doesn't.
8. What are the types of redundancies, explain each of them.
9. Draw and explain the general image compression system model.
10. Develop arithmetic coding for the message VVIT
11. How LZW coding can eliminate inter-pixel redundancy using an example
12. Draw the block diagram of lossless predictive coding model and explain it.
13. What is meant by block transform coding? Explain.
14. What is the result of applying (a) median, (b) min, (c) max, and (d) mid-point filters on the following image?

$$\begin{bmatrix} 11 & 31 & 51 \\ 41 & 41 & 31 \\ 51 & 21 & 21 \end{bmatrix}$$

15. Consider a binary image (for example a fingerprint image) with black background and white foreground (object), what will happen to the shape of object regions (fingerprint ridges) if morphological opening operation is applied using full white structuring element.
16. Consider a one-dimensional image f(x) = {160, 160, 160, 100, 100, 100}. What are the results of applying first and second order derivatives?
17. Consider the pixels {123, 134, 139, 147, 155, 163} and demonstrate the predictive coding with order=1 and alpha=1 indeed achieves compression.
18. Construct Huffman code words for the following information source (A,Z) where A={a1,a2,a3,a4} and Z={0.2,0.4,0.3,0.1}