

(i) Attempt all parts of a question consecutively.

(ii) Full credit will only be given if the Solution is neat, and showing all the required steps.

Q1. Short answer (one line)

- Write the name of photoreceptors in human eye.
- What is false contouring effect in image and how can we reduce it?
- What is the use of Iso-preference curves?
- What is Weber ratio?
- Write two difference between image enhancement and image restoration process.

[2x5]

Q2. a) Is the given 2D filter is separable filter? Justify your answer.

1	1	1	1
1	1	1	1

- Write the four desirable properties of image transforms.
- Apply Bilinear interpolation for given 4x4 patch of an image and find out interpolated 8x8 image. Assume $c = r = 0.5$.

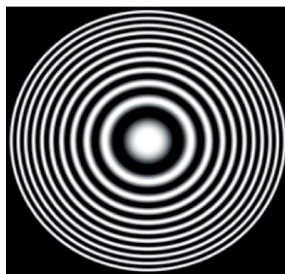
2	1	4	2
3	1	2	1
1	2	1	4
4	1	2	3

d) Show that the probability distribution function (pdf) of histogram equalized image's intensities is uniform pdf.

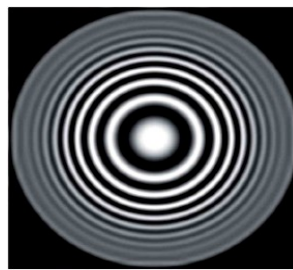
[4x5]

Q3. a) Write the affine transform for Scaling and rotation transform matrices. Find the composite transform matrix for these operation.

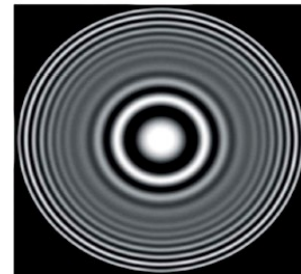
b) Write the mathematical function of zone plate image shown in figure 'i'. It is filtered by filter A and B and results are shown in 'ii' and 'iii' respectively. Identify the type of filter A and B.



'i'



'ii'



'iii'

- Draw the block diagram of Homomorphic Filtering and write its mathematical function.
- Write the mathematical model for exponential noise and calculate its mean and variance.

[4x5]

Q4. a) Write the relation between Wavelet decomposition and reconstruction filters for Perfect reconstruction.

b) Find the synthesis and analysis filters when the low pass synthesis filter is given as:

$$g_0(n) = [0.4830 \quad 0.8365 \quad 0.2241 \quad -0.1294]$$

c) Computing a two-scale fast wavelet transform of sequence $\{1, 4, -3, 0\}$ using Haar scaling and wavelet coefficients as $[0.5, 0.5]$ and $[-0.5, 0.5]$ **[5+5+10]**

Q5. a) For the given 4×4 image, find the information content in it. Design fixed length code for this image. If the image intensities $\{21, 100, 150\}$ are coded as $\{11, 10, 0\}$ respectively then find the average length of given code.

21	100	150	100
21	150	150	100
21	150	150	150
21	100	150	150

b) Explain the Kraft's inequality theorem. The image intensities $\{A, B, C\}$ are coded as $\{1, 0, 10\}$ respectively. Is the code is instantaneous code? Justify your answer. **[10+10]**