

No. of pages: 6

No. of questions: 3

Total marks: 30

**Question 1 (15 marks)**

Choose the correct answer:

- 1) The spatial coordinates of a digital image (x,y) are proportional to:
  - a) Position
  - b) Brightness
  - c) Contrast
  - d) Noise
- 2) Among the following image processing techniques which is fast, precise and flexible.
  - a) Optical
  - b) Digital
  - c) Electronic
  - d) Photographic
- 3) What is pixel?
  - a) Pixel is the elements of a digital image
  - b) Pixel is the elements of an analog image
  - c) Pixel is the cluster of a digital image
  - d) Pixel is the cluster of an analog image
- 4) Assume that an image  $f(x, y)$  is sampled so that the result has M rows and N columns. If the values of the coordinates at the origin are  $(x, y) = (0, 0)$ , then the notation (0, 1) is used to signify :
  - a) Second sample along first row
  - b) First sample along second row
  - c) First sample along first row
  - d) Second sample along second row
- 5) The difference in intensity between the highest and the lowest intensity levels in an image is
  - a) Noise
  - b) Saturation
  - c) Contrast
  - d) Brightness
- 6) In the Visible spectrum the \_\_\_\_\_ color has the maximum wavelength.
  - a) Violet
  - b) Blue
  - c) Red
  - d) Yellow
- 7) How is array operation carried out involving one or more images?
  - a) array by array
  - b) pixel by pixel
  - c) column by column
  - d) row by row

8) The mask shown in the figure below belongs to which type of filter?

	1	2	1
$\frac{1}{16} \times$	2	4	2
	1	2	1

- a) Sharpening spatial filter
  - b) Median filter
  - c) Sharpening frequency filter
  - d) Smoothing spatial filter
- 9) The objective of sharpening spatial filters is/are to \_\_\_\_\_
- a) Highlight fine detail in an image
  - b) Enhance detail that has been blurred because of some error
  - c) Enhance detail that has been blurred because of some natural effect of some method of image acquisition
  - d) All of the mentioned
- 10) What is the basis for numerous spatial domain processing techniques?
- a) Transformations
  - b) Scaling
  - c) Histogram
  - d) None of the Mentioned
- 11) In \_\_\_\_\_ image we notice that the components of histogram are concentrated on the low side on intensity scale.
- a) bright
  - b) dark
  - c) colorful
  - d) All of the Mentioned
- 12) Histogram Equalization is mainly used for \_\_\_\_\_
- a) Image enhancement
  - b) Blurring
  - c) Contrast adjustment
  - d) None of the Mentioned
- 13) The output of a smoothing, linear spatial filtering is a \_\_\_\_\_ of the pixels contained in the neighborhood of the filter mask.
- a) Sum
  - b) Product
  - c) Average
  - d) Dot Product
- 14) What does using a mask having central coefficient maximum and then the coefficients reducing as a function of increasing distance from origin results?
- a) It results in increasing blurring in smoothing process
  - b) It results to reduce blurring in smoothing process
  - c) Nothing with blurring occurs as mask coefficient relation has no effect on smoothing process
  - d) None of the mentioned
- 15) In fixed intensity transformation, when using the power law  $s=cr^\gamma$ . [r is a positive integer number] Increasing the value of  $\gamma$  makes the resulting image \_\_\_\_\_
- a) brighter
  - b) darker
  - c) no change
  - d) gray scale

**Question 2** (5 marks)

- a) Explain with drawing the intensity transformation functions? What is the problem arising from using full scale contrast stretching? (3 marks)

b) Draw and explain the block diagram of the histogram equalization algorithm.

(2 marks)

**Question 3 (10 marks)**

For a 4x4, 4bits/pixel image shown.

- Find the full-scale contrast stretched image.
- Find the histogram equalized image.
- Draw the histogram of the three images and compare between them.

(Hint: the equation of contrast stretch is  $s = \text{round}\left((2^B - 1) \cdot \frac{r - r_{\min}}{r_{\max} - r_{\min}}\right)$ )

2	8	9	9
2	3	10	9
8	3	3	11
8	3	10	11

