Marks Scored:

KATHMANDU UNIVERSITY
End Semester Examination
October, 2017

Level : B.E.
Year : IV

Course : MEPP 438
Semester : II

Exam Roll No. :

Time : 30 mins.

F. M. : 20

Registration No. :

Date OCT: 0 8 2017

SECTION "A"

[20 Q. × 1 = 20 marks]

Choose the most appropriate answers.

1. Image .....is the simplest process and most appealing areas of digital image processing
   a) acquisition b) enhancement c) restoration d) segmentation

2. Human eye have an average diameter approximately of.....
   a) 10 mm b) 20 mm c) 30 mm d) 20.5 mm

3. Experimental evidence indicates that .....is a logarithmic function of light intensity incident on the eye.
   a) brightness adaptation b) subjective brightness
   c) intensity d) reflective index

4. Gray Level of the image is also referred to as.....
   a) resolution b) intensity c) brightness d) pixel

5. Lens of an eye is .....than an ordinary optical lens
   a) more contract b) flexible c) greater d) smaller

6. .....is the total amount of energy that flows from the light sources
   a) Luminance b) Photon c) Radiance d) Brightness

7. Contrast stretching is to increase the .....range of gray level of processed image.
   a) intensity b) dynamic c) brightness d) compression

8. Automatic enhancement is done using.....
   a) local enhancement b) histogram equalization
   c) histogram matching d) auto enhancement

9. Encircle an appropriate statement
   a) The discrete transform pair rarely exists.
   b) Frequency domain refers to time component.
   c) Functions that are not periodic can be expressed as sine and cosine functions.
   d) b & c.

10. Zero –phase shift filter.....
    a) do not change the phase of original image
    b) do not change the phase of transformed image
    c) change the phase of original image
    d) change the phase of transformed image

11. Filter based on Gaussian functions are.....
    a) easily specified b) real functions c) imaginary d) a & b

12. ILPF have.....discontinuity than BLPF.
    a) Sharp b) dull c) mono d) irregular

13. Most devices that deposits colored pigments on paper, such as color printers and copiers, requires ..... Data input.
    a) H S I b) C M Y c) L a b d) R G B

14. Green objects reflect light with wavelength primarily in the .....nm range.
    a) 200-400 b) 300-500 c) 500-700 d) 700-900

15. Visible light have a wavelength range of .....
    a) (0.45-0.7) μm b) (0.7-1.5) μm c) (1.5-12.5) μm d) (12.5-20.5 μm

Fill the brackets with T for True and F for False.

16. Hue and saturation taken together are called as chromaticity ( )

17. Color model is also known as color system ( )

18. A phenomenon where the edges of an image appear blurred when the CCD is exposed to extremely bright light is called blooming ( )

19. Image restoration deals with the technique for enhancing the storage space required to save the image ( )

20. Interpixel redundancy is also coined as interframe redundancy ( )

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SECTION "B"

Attempt *ANY FIVE* questions of the following.

1. a) Mention with examples fields and use of digital image processing. [8]
   b) What is artificial intelligence? How can it be applied to machine vision? [3]

OR

   a) Discuss on Piecewise linear transformation function. [3]
   b) Consider 64 × 64 hypothetical images, whose histogram data is shown below in the table. Transform this histogram so that it will have the values specified in the table as shown and plot histogram of i) original image, ii) specified histogram, iii) Transformation function obtained from histogram, and iv) Result of performing histogram specification. [8]

Original Histogram	
r_k	n_k
0	790
1	1023
2	850
3	656
4	329
5	245
6	122
7	81

Z_q	Specified $Pz(Z_q)$	Actual $Pz(Z_k)$
0	0.00	0.00
1	0.00	0.00
2	0.00	0.00
3	0.15	0.19
4	0.20	0.25
5	0.30	0.21
6	0.20	0.24
7	0.15	0.11

2. a) Write the principal of image formation in the eye? [3]
   b) Explain about spatial and gray-level resolution? [2+2]
   c) Define *ANY TWO* [2× 2=4]
      i. Image operation in pixel basis
      ii. Distance measure
      iii. Linear and non-linear operation

3. a) Write short notes on *ANY TWO* [2 × 3= 6]
      i. Piecewise Linear Transformation Functions
      ii. Procedures to obtain discrete formulation of the histogram-specification.
      iii. Correlation and Convolution
   b) Explain the principle objective of image enhancement process in spatial domain process. [2]

c) Obtain a correlation and convolution of a 2 –D filter with a 2-D discrete impulse. Consider a filter coefficient of [3]

$$\begin{matrix} 1 & 5 & 4 \\ 7 & 2 & 8 \\ 4 & 8 & 6 \end{matrix}$$

4. a) Write short notes on *ANY TWO* [2 × 3 = 6]
   i. Contrast stretching
   ii. Gray level slicing
   iii. Bit plane slicing

   b) Discuss and explain histogram matching? [3]

   c) How an image can be enhanced using arithmetic operations? [2]

5. a) Write an expression for 2D-Discrete Fourier Transform Pair. Define Fourier spectrum, phase angle and power spectrum. [2+3]

   b) Describe on filtering in frequency domain. [3]

   c) State and establish a convolution theorem. [3]

6. a) Briefly discuss on color fundamentals and establish the relationship between HSI and RGB colors [3+2]

   b) Define color image processing? [2]

   c) How color image processing could be applied for industrial purpose with suitable illustration. [4]

7. What is data redundancy? Explain different types of data redundancy techniques used in digital image compression. [11]

8. Discuss on different methods and sources of lighting? [11]