Reg. No.

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL (A constituent unit of MAHE, Manipal)

SEVENTH SEMESTER B. TECH. (INSTRUMENTATION AND CONTROL ENGG.)

END SEMESTER DEGREE EXAMINATIONS, NOVEMBER - 2018

SUBJECT: DIGITAL IMAGE PROCESSING [ICE 4021]

	L. 5 HOURS MAA. MARKS	. 50
	• Answer ALL questions.	
	Missing data may be suitably assumed.	
1A	With the help of neat illustration, explain the components of general purpose image processing system.	4
1 B	Discuss the importance of sampling and quantization process with an example.	4
1C	Find out the time required to transmit a gray-scale and color images of size 256×256 pixels using a transmission rate of 100kbps.	2
2A	Describe the followings with an example,	2
	i) Pixel replication ii) Chessboard distance	
2B	Consider the two image subset S_1 and S_2 as shown in Fig.Q2 (B), For V = {1}, explain whether the two subsets are 4 -, 8 - and m – adjacent.	3

		S	S_1						
0	0	0	0	0	0	0	1	1	0
1	0	0	1	0	0	1	0	0	1
1	0	0	1	0	1	1	0	0	0
0	0	1	1	l	0	0	0	0	0
0	0	1	1	1	0	0	1	1	1
Fig.Q2 (B)									

2C What is histogram matching? For a given image shown in **Fig.Q2** (**C**), having gray-scale values 5 between 0-7, perform the histogram equalization and plot histogram of an image before and after equalization.

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 Fig.Q2 (C)

3A Apply the mask (refer w), by reflecting the border pixels of an image as shown in **Fig.Q3** (A). 2

					F	ig.()3 (A)
	0	1	0		2	4	6	7
w =	1	-4	1		1	1	3	6
	0	1	0		5	2	5	2
					1	2	4	5

- 3B Explain the following with relevant graphs,
 - i) Power-law transformation
 - ii) Gray-level slicing
- 3C Sketch neat block diagram of a homomorphic filtering approach for image enhancement and 5 explain by deriving the expression for its results.
- 4A For the given image segment shown in **Fig.Q4** (A), compute the entropy by grouping adjacent 2 pixels.

Fig.Q4 (A)										
21	21	21	95	169	243	243	243			
21	21	21	95	169	243	243	243			
21	21	21	95	169	243	243	243			
21	21	21	95	169	243	243	243			

- 4B Define fidelity with its objective and subjective criteria.
- 4C What are error-free compression techniques? Compute the Huffman coding for the following 5 probability distribution of source symbols, $P = \{0.4, 0.3, 0.1, 0.1, 0.06, 0.04\}$, also find the average length of generated code.
- 5A Explain how Sobel and Prewitt masks can be used for edge detection.
- 5B With mathematical formulation explain morphological opening and closing operations.
- 5C Mention any 2 application of CAD tools. Describe the expert system for glaucoma identification 5 using non-parametric spatial envelope energy spectrum with fundus images.

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