The University of Burdwan

B.C.A 6th Semester Examination, 2022

Paper Name: Theory of Computation ***Paper Code: BCA 601***

Subject: Computer Application

FULL MARKS: 80 **Time: 3 Hours**

Answer question number 1 and any four from the rest.

1. Answer any eight questions . **8X2=16**

a) Define Finite Automata(FA).

b) Define state -transition diagram with a suitable example

c) Define NFA.

d) Define Regular Expressions.

e) What is context free grammar?

f) State Arden's theorem.

g)Define DFA.

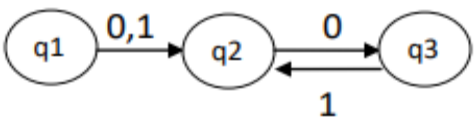
h) Draw the finite automata for the following regular expression: RE: Q=∅

i) What is parse tree?

j) Define PDA.

2. What are useful and useless symbols in grammar? Define alphabet and symbol with example. What are the different types of grammar? Construct a DFA to accept even number of 0's. Construct NFA for the regular expression a*b*. Convert the DFA to NFA, diagram is given below.

[2+2+2+3+3+4=16]



3. Define mealy machine and moore machine with example. What are the differences between mealy and moore machine? Construct a Mealy Machine which is equivalent to the Moore machine given to transition table given below. [3+3+4+6 = 16]

Present state	Next state		Output
	a =0	a=1	
q0	q3	q1	0
q1	q1	q2	1
q2	q2	q3	0
q3	q3	q0	0

4. Explain the various applications of regular expressions. Prove that (0 * 1*) * = (0 + 1)*. Prove that (r *) * = r* for a regular expression r. What is the closure property of regular set? Design a regular expression for the language containing even number of 0's followed by odd number of 1's. [3+3+3+3+4 = 16]

5. What is an ambiguous grammar? Define parse tree with an example. What are the properties of the CFL generated by CFG? What is the language generated by the grammar G = (V, T, P, S) where P={S->aSb, S->ab}. Construct the PDA accepting the language L={($a^n b^{2n}$)|n>=1}. [2+2+2+4+6 = 16]

6. Write short note. I) Pumping Lemma II) Pushdown Automata (PDA) III) Derivation Tree IV) Context-Sensative Grammar . [4+4+4+4 = 16]

7. Write two notes a) Chomsky Normal Form (CNF) b) Epsilon NFA c) Turing Machine

[8+8 = 16]

Or,
The University of Burdwan
BCA(Hons) Semester - VI Examination, 2022
Paper Name: Image Processing *Paper Code:* BCA 601
Subject: Computer Application

F.M:80 **Time: 3 Hrs.**

Answer *question no. 1* and *any four* from the rest.
5×16=80

1. Answer any *eight* questions. **8×2=16**

a) What do you mean by image pixel?
b) What is the digitization process of continuous image data?
c) What are vertical resolution and horizontal resolution?
d) What is city block distance?
e) What do you mean by histogram equalization?
f) What are the basic elements of visual perceptions?
g) What are the elements of an image processing system?
h) Why filtering in digital image is required?
i) What is fourier transform (FT)?
j) What are the needs for image compression technique?
k) What do you mean by image restoration?
l) What is the effect of salt and pepper noise on digital image?

2. Explain sampling and quantization with reference to digital image processing. Calculate the size of image which is represented with 512 colors with x and y coordinates given as 1028×1028. Explain how image is formed in eye and also explain how it is able to discriminate and adapt to brightness?
6+4+6

3. Discuss Huffman coding with proper example. Explain Discrete Cosine Transform (DCT).
10+6

4. Discuss and differentiate Lossy and Lossless image compression methods with proper examples. Discuss first fourier transform.
8+8

5. Give a few applications of region based segmentation in the field of digital image processing. Explain the merits and limitations of thresholding based segmentation. If all the pixels in an image area shuffled, will there be any change in the histogram? Justify your answer.
5+6+5

6. Derive an expression for inverse filter. Compare the effects of weiner filter and least constrained square filter on digital image. With the help of proper example differentiate between point, line, and edge with respect to digital image processing. **4+6+6**

7. Explain Run Length Coding with proper example. Explain two-dimensional recursive filtering for noisy images.

8+8