

Jalpaiguri Government Engineering College  
Unit Test-I, Even Semester 2022  
Design and Analysis of Algorithms (PCC-CS404)

Full Marks: 15

Answer any three questions:

Time Allotted: 45 Minutes  
5×3=15

1. Given the weight vector(2,3,5,7,1,4,1) and the profit vector(10,5,15,7,6,18,3) and a knapsack of capacity 15, find at least three feasible solutions including optimal one for the knapsack problem of seven objects. 5
2. Write a dynamic programming algorithm for travelling salesman problem and calculate it's complexity. 4+1
3. Find out the best case and worst case time complexity of the quick sort algorithm. 2.5+2.5
4. a) What are the characteristics of greedy algorithm? 1  
b) Discuss the procedure for Strassen's matrix multiplication to evaluate the product of nxn matrices. Find the recurrence relation for the same and calculate it's time complexity. 4

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Unit Test-II, Even Semester 2022  
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Full Marks: 15

Time Allotted: 45 Minutes

Answer any three questions:

5×3=15

1. How you will solve the 4-queens problem using backtracking method? Show every steps of your solution. 3+2
2. Find the minimum number of operations required for the following matrix chain multiplication using dynamic programming:  $A(5 \times 4) * B(4 \times 7) * C(7 \times 3) * D(3 \times 9)$ . 5
3. Explain the single source shortest path algorithm? What is it's time complexity? 4+1
4. How you will solve the 0/1 knapsack problem using dynamic programming paradigm? Explain with an example. 2+3

# Jalpaiguri Government Engineering College

## 1<sup>st</sup> Class Test, Subject: Formal Language & Automata Theory

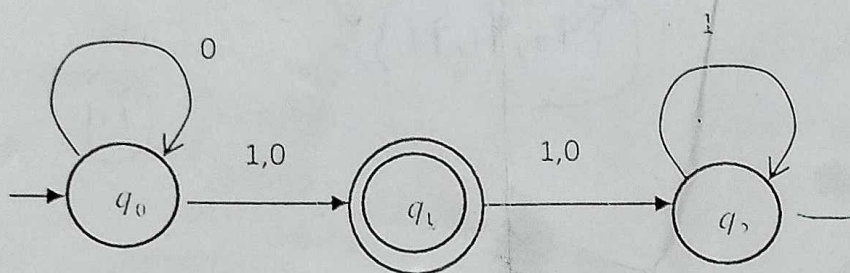
Marks: 15

Time: 45 Minutes

Answer any three questions.

1. Convert the following NFA into an equivalent DFA.

5.



2. Construct the DFA for the following given language:

5

$$L = \{\omega \in \{a, b\}^* : n_a(\omega) \bmod 3 > n_b(\omega) \bmod 3\}$$

3. Construct the DFA for the following given language:

5

$$L = \{\omega : |\omega| \bmod 26 \leq 25\}$$

4. Define formal grammar, DFA and NFA with example.

5

# Jalpaiguri Government Engineering College

2<sup>nd</sup> Class Test, Subject: Formal Language & Automata Theory (PCC-CS403).

Marks: 15

Time: 45 Minutes

Answer any three questions.

1. Construct the finite automaton equivalent to the expression  
 $(0 + 1)^*(00 + 11)(0 + 1)^*$  5
2. Prove that the family of regular languages is closed under set difference. 5
3. Generate regular expression for the given language  
 $L = \{ 0^{2n} 1^{2m} 00 : m \geq 0, n \geq 0 \}$  5
4. Prove that the family of regular languages is closed under complementation. 5



1<sup>st</sup> Class Test, Dept. of CSE, JGEC April 2022, 2<sup>nd</sup> Year, SEM-4 Discrete Mathematics, Paper code- PCC-CS401, Time 3/4 hour. Answer any Three 3×5=15

1. Each user of a computer system has a password which is six to seven characters long, where each character is an upper or lower case English letter or a special character from the set  $\{\#, *, \$\}$ . Each password must contain at least one letter and one digit and one special character. How many possible passwords are there?
2. Show that  $\{(p \wedge q) \rightarrow r\} \rightarrow \{p \rightarrow (q \vee r)\}$  is a tautology. 2M, 2A, 1E, 1I, 1C, 1S, 1M, 2T
3. How many ways the letters of the word MATHEMATICS be arranged in each of which the vowels (i) never occur together (ii) occupy odd positions.
4. Using principle of mathematical induction prove that  $(2+\sqrt{3})^n + (2-\sqrt{3})^n$  is an even integer. 2M, 2A, 1E, 1I, 1C, 1S, 1M, 2T

2nd Class Test , Dept. of CSE ,JGEC May 2022, 2<sup>nd</sup> Year ,SEM-4 Discrete Mathematics ,  
Paper code- PCC-CS401, Time 3/4 hour. Answer any Three 3×5=15

1. Prove that every Cyclic Group is an abelian. But Converse of the theorem is not true
2. If  $f = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 1 & 3 & 4 & 2 \end{pmatrix}$ ,  $g = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 2 & 3 & 4 & 1 \end{pmatrix}$ ,  $h = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 4 & 2 & 1 & 3 \end{pmatrix}$  Prove that  $f(gh) = (fg)h$ .

3. The following table shows the distance, in kilometers, between six villages in India. Find a minimal spanning tree connecting the six villages applying Kruskal's Algorithm.

	A	B	C	D	E	F
A		5 ✓	6 ✓	12 ✓	4 ✓	7 ✓
B	5 ✓		11 ✓	3 ✓	2 ✓	5 ✓
C	6 ✓	11 ✓		8 ✓	6 ✓	6 ✓
D	12 ✓	3 ✓	8 ✓		7 ✓	9 ✓
E	4 ✓	2 ✓	6 ✓	7 ✓		8 ✓
F	7 ✓	5 ✓	6 ✓	9 ✓	8 ✓	

4. By Dijkstra's method find the shortest path from V to W in the following Graph;