



Program: Diploma in Computer Engineering

Full Marks: 80

Year/Part: II/I (2022) © Arjun

Pass Marks: 32

Subject: Discrete Structure

Time: 3 hrs.

Candidates are required to give their answers in their own words as far as practicable. The figures in the margin indicate full marks.

www.arjun00.com.np**Attempt any TEN questions.**

1. Find the power set of the set $\{0, 1, 2\}$. Explain injective and surjective function with suitable examples. [4+4]
2. What are composite functions? Explain different logical connectives with examples. [2+6]
3. Define relations. Show that $p \vee (q \vee r)$ and $(p \vee q) \wedge (p \vee r)$ are logically equivalent. [1+7]
4. Explain Non-deterministic Finite Automata (NFA) with suitable example. [8]
5. What is context free grammar? How many ways are there to select a first prize winner, a second prize winner and a third prize winner from 100 different people who have entered a contest? [2+6]
6. What is pigeonhole principle? What is the solution of the recurrence relation $a_n = a_{n-1} + 2a_{n-2}$ with $a_0 = 2$ and $a_1 = 7$? [2+6]
7. What is degree of vertex? Describe handshaking theorem with suitable example. What is bi-partite graph? [2+4+2]
8. What are paths and circuits in graph? Explain Euler graph with example. [4+4]
9. What is binary tree? Explain pre-order, post-order and in-order tree traversals with suitable examples. [2+6]
10. Prove using mathematical induction that for all $n \geq 1$. $1 + 4 + 7 + \dots + (3n - 2) = \frac{n(3n-1)}{2}$ What is planar graph? [6+2]
11. Write short notes on: (any **TWO**) [2×4]
 - a. Fuzzy set
 - b. Chomsky hierarchy
 - c. Predicate and Quantifiers

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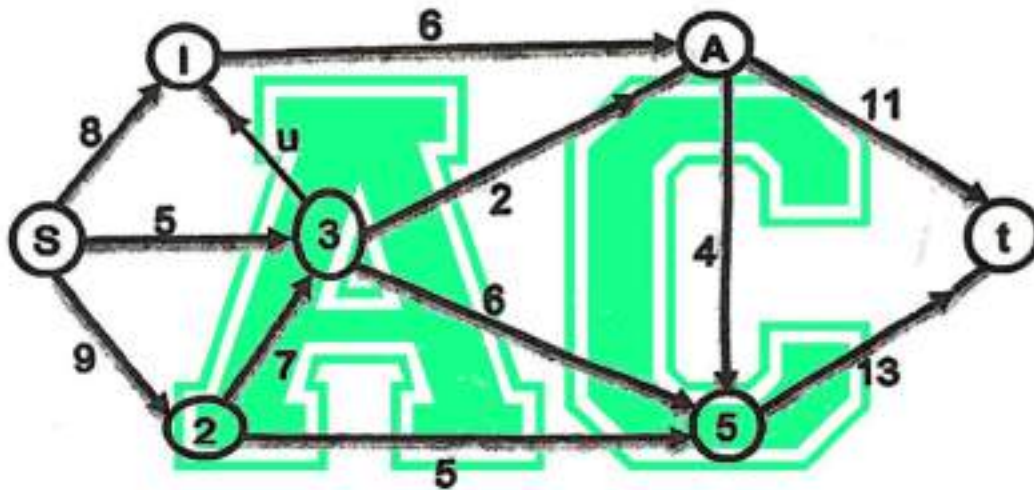


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Attempt **ALL** questions.

1. a. Define power set. What is the power set of the empty set. [2+3]
b. Use a membership table to show that: [7]
$$A \cap (B \cap C) = (A \cap B) \cup (A \cap C)$$
2. a. Explain the propositional logic. [5]
b. Show that if n is a positive integer, then [7]
$$1 + 2 + \dots + n = \frac{n(n+1)}{2}$$
3. a. Prove that 'if n is an integer and $3n+2$ is odd, then n is odd', [5]
using contradiction method.
b. State pigeonhole principle. Solve the recurrence relation: [7]
 $a_n = 5a_{n-1} - 6a_{n-2}$ with initial condition $a_0 = 1$,
 $a_1 = 2$.
4. a. Define preposition. Consider the argument, "John, a [6]
student in this class knows how to write program in C.
Everyone who knows how to write program in C can get a
high paying job. Therefore, someone in this class can get
high paying job". Now, explain which rules of interfaces
are used for each step.
b. Give the example of ceiling, floor and Boolean function. [6]
How do you plot the graph of the function?
5. a. What are the significance of minimum spanning tree? [8]
Describe how Kruskal's algorithm can be used to find
MST.

- b. A group contains 5 men and 4 women. How many ways are there to arrange these people in a row if the men and women alternate? [4]
6. Define Euler circuit with suitable example. Find the maximal flows from S to T from the given network. [10]



7. Write short notes on: (any TWO) [2×5]
- Chomsky hierarchy
 - BFS and DFS
 - NFA

Good Luck !



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Council for Technical Education and Vocational Training

Office of the Controller of Examinations

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Regular Exam-2080 Bhadra

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Attempt **ALL** questions.

1. a. What is function? Explain injective and bijective functions. [2+6]
b. Define fuzzy sets. [2]
2. a. How do you define the term regular expression and regular grammar? [3]
b. What is Finite State Automation (FSA)? Construct a finite state machine that gives an output of 1 if and only if last three bits received are all 1s. Your design should include the transition table and transition diagram. [7]
3. a. Define predicate and quantifiers. Explain rules of inference in propositional and predicate logic. [2+3]
b. Find all the solution of recurrence relation:
 $a_n = 3a_{n-1} + 4a_{n-2} + 3^n$ with initial condition $a_0 = 1$ and $a_1 = 2$. [5]
4. a. What is tree and what are its application? [4]
b. In how many ways 5 computer engineers and a civil engineer can be seated in a round table if:
i. there is no restriction?
ii. all the four computer engineers sit together?
iii. all the four computer engineers don't sit together? [6]
5. a. Explain about incidence matrix technique for graph representation. [5]
b. Define regular graph and write its properties. [5]
6. a. How can we represent sets in computer? If $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, use bit strings to find the union and intersection of the set $A = \{1, 2, 3, 4, 5\}$ and $B = \{3, 4, 5, 6, 7\}$. [5]

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Cont.

- b. If R be a relation in the set of integers z defined by:
 $R = \{(x, y): x \in z, y \in z, (x - y) \text{ divisible by } 6\}$.
Then prove that R is an equivalence relation. [5]
7. a. Explain NFA to DFA conversion with example. [4]
b. Describe graph traversal (BFS and DFS) in brief. [6]
8. Write short notes on: (any TWO) [2×5]
a. Chomsky hierarchy
b. Handshaking theorem
c. Euler and Hamilton graph

Good Luck



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