



ISO 9001:2008 Certified Institute

Java Institute for Advanced Technology

Department of Examinations

COURSE	DIPLOMA IN SOFTWARE ENGINEERING
SUBMISSION DATE	26th JUNE 2022
UNIT NAME	MATHEMATICS FOR COMPUTER SCIENCE I (PAPER II)
EXAMINATION ID	H7E2 04/EX/01
SUBMISSION MEDIUM	SOFT COPY (PDF DOCUMENT)



INSTRUCTIONS TO CANDIDATES

- This exam paper contains **SIX (6)** questions. You have to answer any **FIVE (5)** questions.
- The total score for this examination is 100 marks.
- It is needed to submit your answer sheets as PDF document and make sure to rename it as your name, NIC and batch name.

NAME	:
		(BLOCK CAPITALS)
ADMISSION NO	:
NIC NO	:

Java Institute for Advanced Technology
Sri Lanka

Question 1

- I. To convert 110101_2 to its decimal equivalent, write the appropriate place value over each bit and then add up those powers of two which are weighted by 1 :
- II. To convert $73D5_{16}$ to its decimal equivalent, express the number in expanded notation, change D to 13, and then calculate using decimal arithmetic.
- III. Convert to hexadecimal form
 - (a) 10110100101110_2
 - (b) 11100.1011011011_2
- IV. Perform each of the addition operations indicated below.
 - a. $(1001011)_2 + (11101)_2$
 - b. $(4556)_8 + (1245)_8$
 - c. $(BCD)_{16} + (A34)_{16}$

Question 2

- I. Simplify followings
 - (a) $X = ABC + \overline{A}B + AB\overline{C}$
 - (b) $X = \overline{A}B\overline{C} + A\overline{B}\overline{C} + \overline{A}\overline{B}C + A\overline{B}C$
- II. Find the sum-of-products and product of sums equations from the given truth Table

A	B	C	Output Functional Values
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	0

- III. Design combinational circuits to represent followings
 - a. $(x) = \bar{x}$
 - b. $(x, y) = x \vee y$
- IV. A burglar alarm for a house is controlled by a switch. When the switch is on, the alarm sounds if either the front or back doors or both doors are opened. The alarm will not work if the switch is off. Design a circuit of logic gates for the alarm and draw up the corresponding truth table.

Question 3

- I. A company pays a basic salary of Rs. 8000/- to the salesmen. If a salesman does sales of Rs. 50,000/- or above, he is given a 25% commission. Otherwise only 10%. Input the sales done by a salesman and calculate his salary for the month.(Hint: Use flow chart)
- II. Write a pseudo code that inputs two numbers (a and b) and output the largest number.
- III. Write an algorithm in pseudo code that calculates the sum of powers of two numbers A and B as shown by the formula below and display the result. The number B must be half of three times A.
$$R = A^B + B^A$$
- IV. Create pseudo code to compute the volume of a sphere. Use the formula: $V = (4/3) * \pi r^3$ where π is equal to 3.1416 approximately, where r is the radius. Display the result.

Question 4

- I. Let A and B be two finite sets such that $n(A) = 20$, $n(B) = 28$ and $n(A \cup B) = 36$, find $n(A \cap B)$.
- II. In a group of 100 persons, 72 people can speak English and 43 can speak French. How many can speak English only? How many can speak French only and how many can speak both English and French?
- III. If $A = \{2, 4, 6, 9\}$ and $B = \{4, 6, 18, 27, 54\}$, $a \in A$, $b \in B$, find the set of ordered pairs such that 'a' is factor of 'b' and $a < b$.
- IV. A survey of 300 summer movie patrons found that most movie patrons viewed one of three types of movies: comedy, romance, and action. Let
C= represent summer comedies
R= represent summer romance movies
A= represent summer action movies
 $n(C)=156$ $n(R)= 106$ $n(A)=133$ $n(C \cap R \cap A)= 8$ $n(C \cap R)=53$
 $n(R \cap A)=41$ $n(C \cap A)=87$
 - a. How many summer movie goers did not see a comedy, romance, or action movie?
 - b. How many summer movie goers saw a comedy or action movie?
 - c. How many summer movie goers only saw a romance movie?

Question 5

I. Find the values of x , y , z and a which satisfy the matrix equation

$$\begin{bmatrix} x+3 & 2y+x \\ z-1 & 4a-6 \end{bmatrix} = \begin{bmatrix} 0 & -7 \\ 3 & 2 \end{bmatrix}$$

II. If $A = \begin{bmatrix} 3 & 1 & 2 \\ 1 & 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -1 \\ 2 & 1 \\ 3 & 1 \end{bmatrix}$ find AB

III. Solve the system using Cramer's Rule

$$\begin{aligned} x + z &= 0 \\ x - 3y &= 1 \\ 4y - 3z &= 3 \end{aligned}$$

IV. Show that A and B are square matrices of the same size, then $\text{Det}(AB) = \text{Det}(A) \text{Det}(B)$.

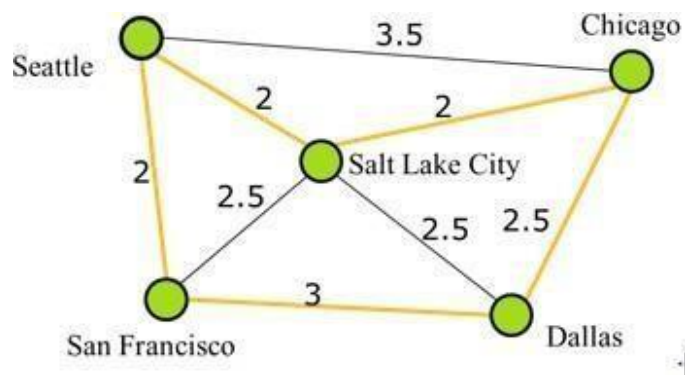
Let $A = \begin{bmatrix} 4 & 3 \\ 1 & 2 \end{bmatrix}$ and Let $B = \begin{bmatrix} 6 & 7 \\ 5 & 8 \end{bmatrix}$ then $AB = \begin{bmatrix} 39 & 52 \\ 16 & 23 \end{bmatrix}$

Question 6

I. Define Graph and Digraph by using diagram.

II. Find Path length and Path cost for following root.

$P = [\text{Seattle}, \text{Salt Lake City}, \text{Chicago}, \text{Dallas}, \text{San Francisco}]$



III. Suppose that in a group of 5 people: A, B, C, D, and E, the following pairs of people are acquainted with each other.

- A and C
 - A and D
 - B and C
 - C and D
 - C and E
-
- a. Draw a graph G to represent this situation.
 - b. List the vertex set, and the edge set, using set notation. In other words, show sets V and E for the vertices and edges, respectively, in $G = \{V, E\}$.
 - c. Draw an adjacency matrix for G .