Reference No : 00048647

JAVA INSTITUTE FOR ADVANCED TECHNOLOGY
DEPARTMENT OF EXAMINATIONS

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PROFESSIONAL DIPLOMA IN SOFTWARE ENGINEERING
EXAM ADMISSION

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EXAMINATION NO	: H7E2 04/EX/01
UNIT NAME	: MATHEMATICS FOR COMPUTER SCIENCE I
DATE	: 2022-06-26
TIME	: 9:00 AM - 12:00 PM
EXAMINATION CENTER	:

.....
Candidate Signature

.....
Examination Officer

00048647

Examinations Rules and Regulations

- Candidates should be aware of these guidelines before the examination commences
- Each candidate should be present at the examination hall 30 minutes prior to the starting time of the examination
- For identification purposes a java institute student identity card should be provided by the candidate at the examination
- Apart from the items required for the examination the candidate is strictly prohibited from bringing in any other item (The department of examinations does not take responsibility for any item placed outside the examination hall)
- Each candidate should be seated at the seat designated for him or her
- All the required quantities of pens and pencils required for writing should be brought by the candidate
- No person can exit the examination hall during the first hour of the examination
- The examination officer should be only alerted for any issue by raising the candidate's hand
- The usage of any electronic device is prohibited during the examination
- During the examination the exchange of any item or communication of any form is strictly prohibited
- Each and every question paper, answer sheet, and draft paper should be provided to the supervising officer of the examination hall
- Any complaint or any appeal pertaining to the examination should be made within a period of 2 days after the examination
- The supervising officer of the examination has the authority to cancel the examination of the candidate if any law mentioned above is broken

Paper - II

Question 1

1.I.

$$\begin{array}{cccccc} 1 & 1 & 0 & 1 & 0 & 1 \end{array}$$

$$(1\times2^5)+(1\times2^4)+(0\times2^3)+(1\times2^2)+(0\times2^1)+(1\times2^0)$$

$$32+16+0+4+0+1$$

$$53_{10}$$

1.II.

$$\begin{array}{cccc} 7 & 3 & D & 5 \\ 7 & 3 & 13 & 5 \end{array}$$

$$(7\times16^3)+(3\times16^2)+(13\times16^1)+(5\times16^0)$$

$$28672+768+208+5$$

$$29653_{10}$$

1.III. (a)

$1\ 0$	$1\ 1\ 0\ 1$	$0\ 0\ 1\ 0$	$1\ 1\ 1\ 0$
$2^1\ 2^0$	$2^3\ 2^2\ 2^1\ 2^0$	$2^3\ 2^2\ 2^1\ 2^0$	$2^3\ 2^2\ 2^1\ 2^0$
$2+0$	$8+4+0+1$	$0+0+2+0$	$8+4+2+0$
2	13	2	14
2	D	2	E

$$2D2E_{16}$$

1.III. (b)

$1\ 1\ 1$	$0\ 0\ 1\ 0$	$1\ 1\ 0\ 1$	$1\ 0\ 1\ 1$
$2^2\ 2^1\ 2^0$	$2^3\ 2^2\ 2^1\ 2^0$	$2^3\ 2^2\ 2^1\ 2^0$	$2^3\ 2^2\ 2^1\ 2^0$
$4+2+1$	$0+0+2+0$	$8+4+0+1$	$8+0+2+1$
7	2	13	11
7	2	D	B

$$72DB_{16}$$

1.IV (a)

$$\begin{array}{r} 1001011_2 \\ 11101_2 \\ \hline 1101000_2 \end{array}$$

1101000_2

(b)

$$\begin{array}{r} 4556_8 \\ 1245_8 \\ \hline 6023_8 \end{array}$$

6023_8

(c)

$$\begin{array}{r} BCD_{16} \\ A34_{16} \\ \hline 1601_{16} \end{array}$$

1601_{16}

Question 5

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

$x+3 = 0$

$x = 0-3$

$x = -3$

$\Rightarrow$

$2y + x = -7$

$2y + (-3) = -7$

$2y - 3 = -7$

$y = \frac{-4}{2}$

$y = -2$

$z - 1 = 3$

$z = 3 + 1$

$z = 4$

$4a - 6 = 2$

$a = \frac{8}{4}$

$a = 2$

$x = -3$

$y = -2$

$z = 4$

$a = 2$

5. II. $A = \begin{bmatrix} 3 & 1 & 2 \\ 1 & 0 & 1 \end{bmatrix}$ $B = \begin{bmatrix} 1 & -1 \\ 2 & 1 \\ 3 & 1 \end{bmatrix}$

$AB = \begin{bmatrix} 3 & 1 & 2 \\ 1 & 0 & 1 \end{bmatrix}_{2\times3} \begin{bmatrix} 1 & -1 \\ 2 & 1 \\ 3 & 1 \end{bmatrix}_{3\times2}$

$$AB = \begin{bmatrix} (3\times1)+(1\times2)+(2\times3) & (3\times-1)+(1\times1)+(2\times1) \\ (1\times1)+(0\times2)+(1\times3) & (1\times-1)+(0\times1)+(1\times1) \end{bmatrix}_{2\times2}$$

$$AB = \begin{bmatrix} 11 & 0 \\ 4 & 0 \end{bmatrix}_{2\times2}$$

5. III. $x + z = 0$

$x - 3y = 1$

$4y - 3z = 3$

$$[A] = \begin{bmatrix} 1 & 0 & 1 \\ 1 & -3 & 0 \\ 0 & 4 & -3 \end{bmatrix}, \quad [B] = \begin{bmatrix} x \\ y \\ z \end{bmatrix}, \quad [C] = \begin{bmatrix} 0 \\ 1 \\ 3 \end{bmatrix}$$

$$D = \begin{vmatrix} 1 & 0 & 1 \\ 1 & -3 & 0 \\ 0 & 4 & -3 \end{vmatrix}$$

$= 1(9-0) - 0(-3-0) + 1(4-0)$

$= 9 - 0 + 4$

$= 13$

5. III. $D_1 = \begin{vmatrix} 0 & 0 & 1 \\ 1 & -3 & 0 \\ 3 & 4 & -3 \end{vmatrix}$

$= 0(9-0) - 0(-3-0) + 1(4+9)$

$= 0 - 0 + 13$

$= 13$

$D_2 = \begin{vmatrix} 1 & 0 & 1 \\ 1 & 1 & 0 \\ 0 & 3 & -3 \end{vmatrix}$

$= (1 \times -3) - (0 \times -3) + (1 \times -9)$

$= -3 - 0 - 9 + 13$

$= -3 - 0 + 3$

$= 0$

$D_3 = \begin{vmatrix} 1 & 0 & 0 \\ 1 & -3 & 1 \\ 0 & 4 & 3 \end{vmatrix}$

$= (1 \times -13) - (0 \times 3) + (0 \times 4)$

$= -13$

$x = \frac{D_1}{D} = \frac{13}{13} = 1$

$y = \frac{D_2}{D} = \frac{0}{13} = 0$

$z = \frac{D_3}{D} = \frac{-13}{13} = -1$

$x = 1$

$y = 0$

$z = -1$

5. IV. $AB = \begin{bmatrix} 4 & 3 \\ 1 & 2 \end{bmatrix}_{2\times2} \begin{bmatrix} 6 & 7 \\ 5 & 8 \end{bmatrix}_{2\times2}$

$$\begin{bmatrix} (4\times6)+(3\times5) & (4\times7)+(3\times8) \\ (1\times6)+(2\times5) & (1\times7)+(2\times8) \end{bmatrix}_{2\times2}$$

$$\begin{bmatrix} 24+15 & 28+24 \\ 6+10 & 7+16 \end{bmatrix}_{2\times2}$$

$$\begin{bmatrix} 39 & 52 \\ 16 & 23 \end{bmatrix}_{2\times2} //$$

Question 2

2.I. (a) $X = ABC + \bar{A}B + AB\bar{C}$

$= AB(C + \bar{C}) + \bar{A}B$

$= AB + \bar{A}B$

$= B(A + \bar{A})$

$= B$ //

~~(b) $X = \bar{A}B\bar{C} + A\bar{B}\bar{C} + \bar{A}\bar{B}C + \bar{A}\bar{B}\bar{C}$~~

~~$= \bar{A}(BC + BC) + \bar{B}$~~

~~$= \bar{A}\bar{C}(B + \bar{B}) + \bar{B}\bar{C}(A + \bar{A})$~~

~~$= \bar{A}\bar{C} +$~~

(b) $X = \bar{A}B\bar{C} + A\bar{B}\bar{C} + \bar{A}\bar{B}\bar{C} + \bar{A}B\bar{C}$

$= \bar{A}\bar{C}(B + \bar{B}) + \bar{B}\bar{C}(A + \bar{A})$

$= \bar{A}\bar{C} + \bar{B}\bar{C}$

$= \bar{C}(\bar{A} + \bar{B})$ //

Question 4

4.I. $n(A \cup B) = n(A) + n(B) - n(A \cap B)$

$36 = 20 + 28 - n(A \cap B)$

$n(A \cap B) = 20 + 28 - 36$

$n(A \cap B) = 12$ //

4.II. $100 = 72 + 43 - y$

$100 = 115 - y$

$y = 115 - 100$

$y = 15$

People can speak English only $= 72 - 15$

$= 57$ //

People can speak French only $= 43 - 15$

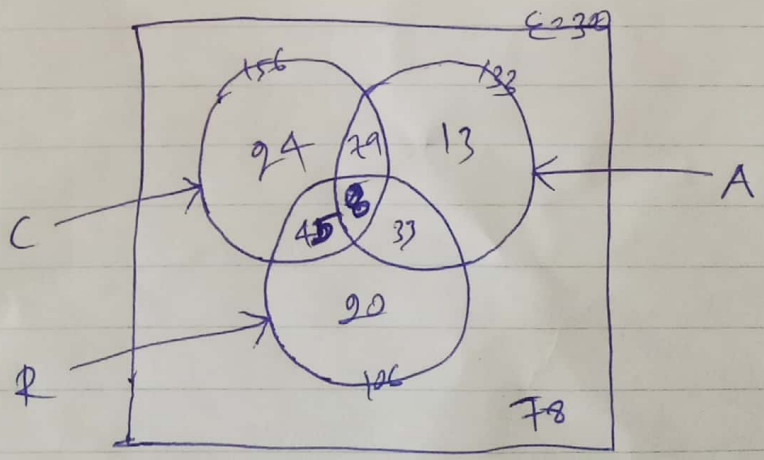
$= 28$ //

People can speak both English and French $= 15$ //

4.III. {(2, 4), (2, 6), (2, 18), (6, 18), (9, 18), (9, 27), (2, 54), (6, 54), (9, 54)}

4.IV. (a) $300 - 222$

$= 78$ //



4.IV. (b) 116 //

4.IV. (c) 20 //

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Question 3

3. I

3. II. Step 1 Start
Step 2 Input a, b
Step 3 IF a > b, then LARGE = a, Otherwise LARGE = b
Step 4 Print LARGE
Step 5 Stop