Part - A

Question - A1

(1) $(A4.D)_{16} + (62)_{8} - (1011.1)_{2} + (34.5)_{10} = X_{8}$

First converting all values of left side to base 10 also known as decimal.

(i) $(A4.D)_{16} \longrightarrow (\ )_{10}$

$\rightarrow$ A = 10, 4 = 4, D = 13 in Hexa

$\rightarrow (A \times 16^{1}) + (4 \times 16^{0}) + (D \times 16^{-1})$

$\rightarrow (10 \times 16) + (4 \times 1) + (13 \times \frac{1}{16})$

$\longrightarrow (164.8125)_{10}$

(ii) $(62)_{8} \rightarrow (\ )_{10}$

$(6 \times 8^{1}) + (2 \times 8^{0})$

$(6 \times 8) + (2 \times 1)$

$48 + 2$

$(50)_{10}$

(iii) $(1011.1)_2 \rightarrow (\ )_{10}$

$(1 \times 2^3) + (0 \times 2^2) + (1 \times 2^1) + (1 \times 2^0) + (1 \times 2^{-1})$

$(1 \times 8) + (0 \times 4) + (1 \times 2) + (1 \times 1) + (1 \times \frac{1}{2})$

$(8) + (0) + (2) + (1) + (0.5)$

$(11.5)_{10}$

(iv) $(34.5)_{10}$ No need to convert the this last one, it's already in base 10.

So,

$(164.8125)_{10} + (50)_{10} - (11.5)_{10} + (34.5)_{10} = X_8$

$(237.8125)_{10} = X_8$

8	237
8	29 -5
	1 -3

8	237
8	29 -5
8	3 -5
	0 -3

$(355)_8$

$.8125 \times 8 = \underline{6}.50$

~~6.50~~

$.50 \times 8 = \underline{4}.00$

$(.64)_8$

So

$X_8 = (355.64)_8$ Ans.

$X = 355.64$

Question-A2

Using 2's complement in 8 bit-register, ~~evaluate~~. $-25_{10} + 24_{10}$

$-25_{10} + 24_{10}$

00011001 ← convert to binary. base 2.

↓ 1's complent (invert bits)

11100110

$+1$ (2's complement add 1)

$(11100111)_2$ → this is equivalent to (-25) in binary. base 2.

$+24$

$\downarrow$

$(00011000)_2$

Now add

$-25 + 24$

So,

$$\begin{array}{r} 11100111 \quad \Leftarrow (-25)_{10} \\ 00011000 \\ \hline (11111111)_2 \end{array}$$

$\downarrow$

$$\begin{array}{r} 00000000 \quad \text{1's complent} \\ +1 \\ \hline 00000001 \quad \text{2's complent} \end{array}$$

evaluate this

computer would $\uparrow$ $\boxed{-00000001}$ Ans value in 8-bit register.

Question -A3

Total students = 40

{cats} = A
{Dogs} = B
{birds} = C

{Universal set} = U

(A ∪ B ∪ C) = (only cats) + (only dogs)
+ (only birds) + (cat and dogs only)
+ (dogs and birds only)
+ (dogs and
+ (cats and birds only)
+ (cats and dogs and birds)

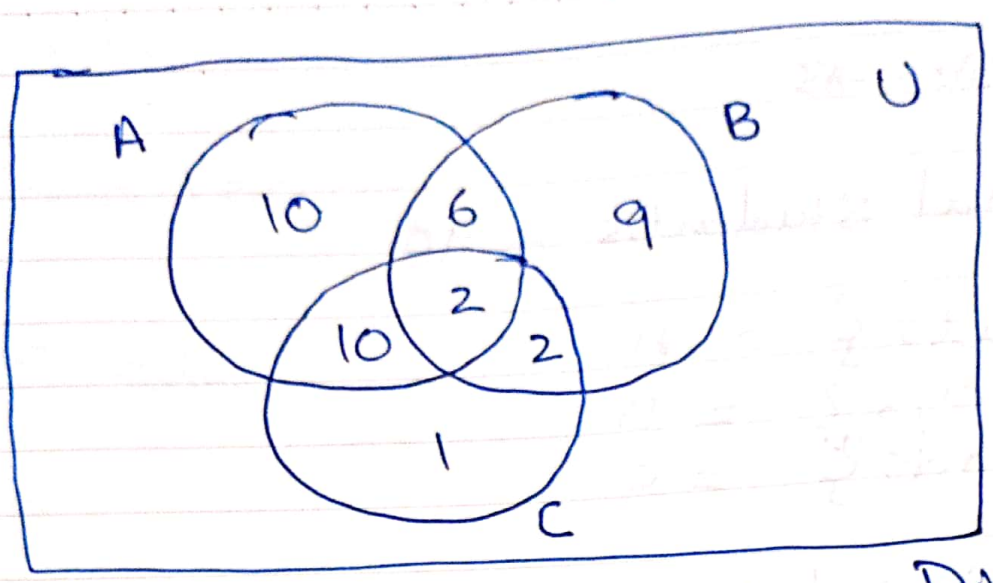
So,

(A ∪ B ∪ C)

(A ∪ B ∪ C) = n(A) + n(B) + n(C)
+ n(A ∩ B) + n(A ∩ C) + A(B ∩ C)
+ (A ∩ B ∩ C)

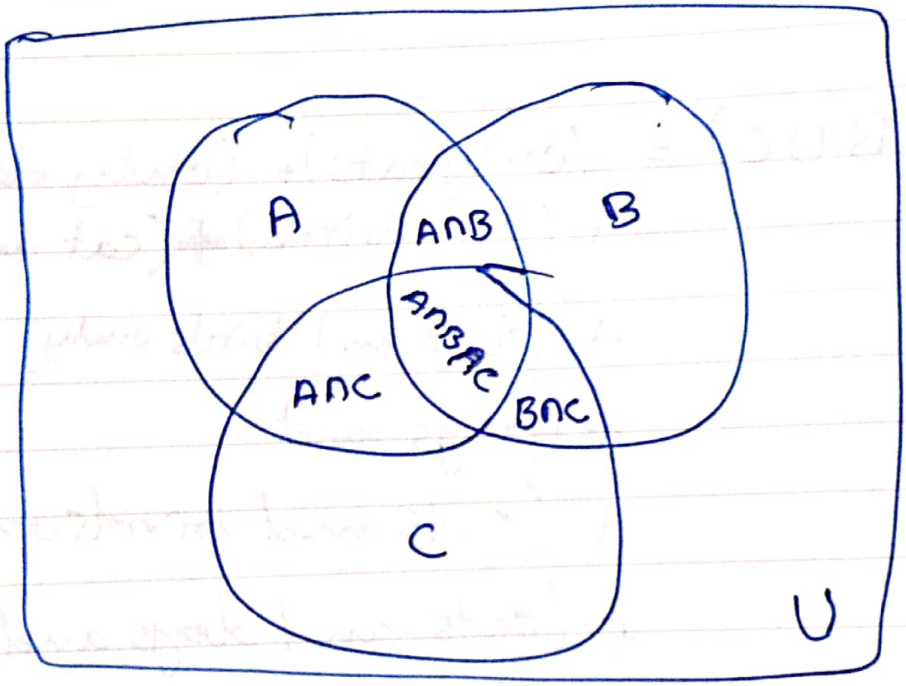
40 = 10 + 9 + 1 + 6 + 10 + 2 + A ∩ B ∩ C

A ∩ B ∩ C = 40 − 38 = 2



Ans

Venn Diagram



Venn Diagram

Question A4

(i) Given $f(x) = 3x^2 + 1$ and $g(x) = 2x - 1$

Find

$f \circ g(-1)$

$f(g(-1))$

$((2x-1)^2 + 1)$

$((2(-1)-1)^2 + 1)$

$((-2-1)^2 + 1)$

$((-3)^2 + 1)$

$(9+1)$

(10) Ans.

(ii) ~~$g(x)$~~

$g^{-1}(x)$

~~$g(x) = 2x - 1$~~

let $y = g(x)$

then $\boxed{x = g^{-1}(y)}$

If $y = 2x - 1$

then $x = \frac{y+1}{2}$

remember ✱
$x = g^{-1}(y)$

$g^{-1}(y) = \frac{y+1}{2}$

$g^{-1}(x) = \frac{x+1}{2}$

$g^{-1}(x) = \frac{x-1}{2}$ Ans.

Question A5

(i)

A B C D E F G H

~~8! × 8!~~ $\frac{3!}{8!}$

(ii) 6 — 8

$6! + 5!$

$720 + 120$

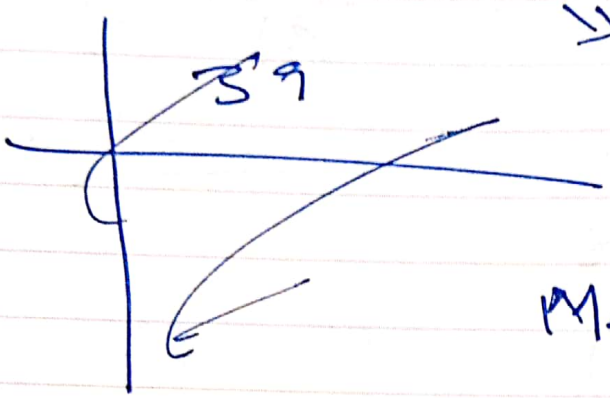
840 Possible configurations.

Part B

Q.1 A

(a)

$(-39.75)_{10}$



$\rightarrow$ 100111.11

1.00111111×10^5

Mantisa = 11111000

Power = 5

Exponent = Power + Bias

= 5 + 31

Exponent = 36

2	36
2	18 - 0
2	9 - 0
2	4 - 1
2	2 - 0
2	1 - 0

~~So sign = 1~~

$\Rightarrow (100100)_2$

Sign = 1 (because value is -ve)

Sign	Exponent Mantisa	Mantisa
1	100100	11111000

1 1 00 100 11111000

Ans

~~0 100 1111 1000~~

(b)

$(0100\ 0110\ 1110\ 1000)_2$

S E M

Sign = 0

Exponent = $1000.11_{2^2\ 2^1}$

= 35

n = Exponent − Bias

n = 35 − 31

n = 4

Mantisa = .01110 1000 = 0.453215

S will be +1 because of +ve

$S \times (1+M) \times 2^n$

$(+1) \times (1+0.453125) \times 2^4$

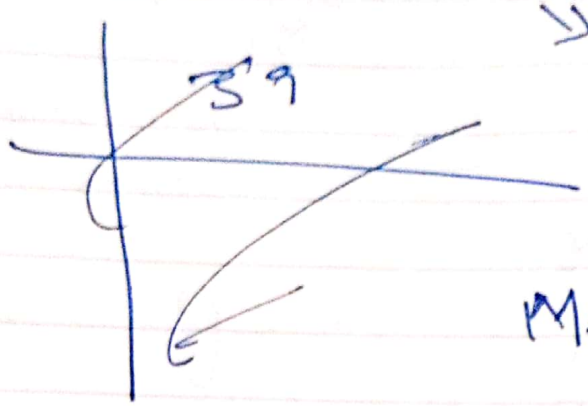
+23.25 Ans.

Part B

Q.1 A

(a)

$(-39.75)_{10}$



» 100111.11

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2	18 - 0
2	9 - 0
2	4 - 1
2	2 - 0
	1 - 0

So sign = 1

$\Rightarrow (100100)_2$

Sign = 1 (because value is -ve)

Sign	Exponent	Mantisa
1	100100	1111 000

1 1 00 100 1111 000

Ans

~~0 100 1111 1000~~

(b)

$$(0100\ 0100\ 1110\ 1000)_2$$

S E M

Sign = 0

Exponent = 1000.11 (32, 21)

= 35

n = Exponent − Bias

n = 35 − 31

n = 4

Mantisa = .0 1110 1000 = 0.453215

S will be +1 because of +ve

$S \times (1+M) \times 2^n$

$(+1) \times (1+0.453125) \times 2^4$

+23.25

Ans.

(a) Part B

(i) $\{1, 23\} \subset \{0, 1, 2, 3\}$

this is proper subset

True Ans

(ii) $\{a\} \in \{a, b, c\}$

a is element of set containing a, b, c

True Ans

(iii) $\{0, 1, 2, 3, 4\} \subset \{x \mid x \in Z^+, x < 5\}$

Proper set

True Ans

(b) $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$

A, B, C Subset of U

$A = \{x : x \text{ is a prime number}\}$

$B = \{\text{even}\}$

$C = \{\text{integer divisible by } 4\}$

(i)

$A = \{2, 3, 5, 7\}$

$B = \{2, 4, 6, 8\}$

$C = \{4, 8\}$

Ans

(ii) $(B \cap C) / A'$

$\{2\} / \{1, 4, 6, 8, 9\}$

$\{2\}$

(iii)

$A \cap B$, $n[P(A \cap B)]$

$\downarrow$

$\{2\}$

1_{Ans}

$= (2)^1$

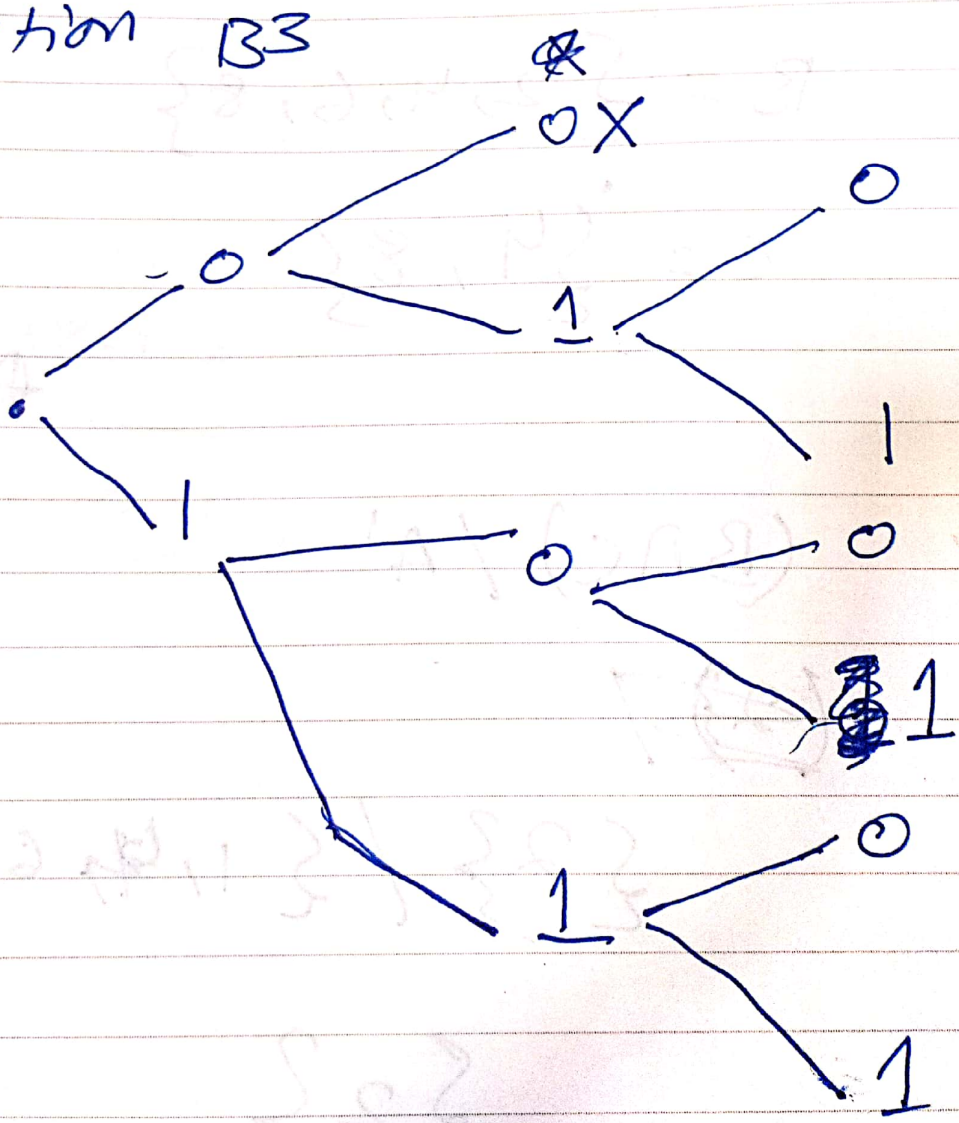
$= 2$

$P(\ ) = 2^3$

2 Ans.

Question B3

(a)



(b)

(c) 7 grec 10 white

7! × 4 or 4

7! + 10!