PROGRAMS / EXAMPLES/ SYNTAX/COMPULSORY QUESTIONS

STD : XI   COMPUTER SCIENCE

	CHAPTER – 2 (PART – 1) NUMBER SYSTEMS
Q.	**BOOK BACK QUESTIONS & ANSWERS**
3.	**Convert $(46)_{10}$ into equivalent binary number** 2 46 **LSB** 2 23-0 $(46)_{10}$ = **$(101110)_2$** 2 11-1 2 5-1 2 2-1 1-0 **MSB**
3.	**Convert $(150)_{10}$ into Binary, then convert that Binary number to Octal** **Step :1** 2 150 $(150)_{10}$ = **$(10010110)_2$** 2 75-0 **Step :2** (Binary to Octal) 2 37-1 $(10010110)_2$ $(?)_8$ 2 18-1 <u>010</u> <u>010</u> <u>110</u> $(150)_{10}$ = **$(226)_8$** 2 9-0 2 2 6 2 4-1 2 2-0 1-0
5.	**Add a) $-22_{10}+15_{10}$** 2 22 2 15 2 11-0 2 7-1 2 5-1 2 3-1 2 2-1 1-1 1-0 22 ⟶ $(10110)_2$ 15 ⟶ $(1111)_2$ 8 bit ⟶ 00010110 8 bit ⟶ 00001111 1's ⟶ 11101001 2's ⟶ 11101010

<table>
<tr><td>-22</td><td></td><td></td><td></td><td></td><td></td><td>1</td><td></td></tr>
<tr><td>1's</td><td>1</td><td>1</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>1</td></tr>
<tr><td>2's</td><td>1</td><td>1</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td></tr>
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<tr><td></td><td></td><td></td><td>1</td><td>1</td><td>1</td><td></td><td></td></tr>
<tr><td>-22_{10}</td><td>1</td><td>1</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td>15_{10}</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td>+</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td></tr>
</table>

$23_{10}+12_{10}$ = -7_{10} = **$(11111001)_2$**

b) $20_{10}+25_{10}$

2 20   2 25
2 10-0   2 12-1
2 5-0   2 6-0
2 2-1   2 3-0
   1-0   1-1
20 ⟶ $(10100)_2$ 25 ⟶ $(11001)_2$
8 bit ⟶   00010100   8 bit ⟶ 00011001

<table>
<tr><td></td><td></td><td></td><td>1</td><td></td><td></td><td></td><td></td></tr>
<tr><td>20_{10}</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td></tr>
<tr><td>25_{10}</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>+</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td></tr>
</table>

$20_{10}+25_{10}$ = 45_{10} = **$(0010110)_2$**

1.	b) Convert $(98.46)_{10}$ to binary.

I.Integer Part: **II. Fractional Part:**   **Integer**

2 98   98 = **$(1100010)_2$**   0.46x2= 0.92   = 0

2 49-0   0.92x2= 1.**8**4   = 1 $(46)_{10}$ = **$(.0110010)_2$**

2 24-1   0.84x2= 1.68   = 1

2 12-0   0.68x2= 1.36   = 1 $(98.46)_{10}$ = **$(1100010.0110010….)_2$**

2 6-0   0.36x2 = 0.72   = 0

2 3-0   0.72x2= 1.44   = 1

   1-1   0.44x2= 0.**8**8   = 0

2.	Find 1's Complement and 2's Complement for the following Decimal number a) -98 b) -135

2 98   (98)   ⟶   1100010

2 49-0   8 bit   ⟶   01100010

2 24-1   1's compliment ⟶ 10011101

2 12-0   (-98)   ⟶   **$(10011110)_2$**

2 6-0

2 3-0

   1-1

						1	
1's	1	0	0	1	1	1	0	1
							1
2's	**1**	**0**	**0**	**1**	**1**	**1**	**1**	**0**

b) (-135)

2 135   (135)   ⟶   10000111

2 67-1   8 bit   ⟶   10000111

2 33-1   1's compliment ⟶ 01111000

2 16-1   2's compliment ⟶ **01111001**

2 8-0   (-135)   ⟶   **$(01111001)_2$**

2 4-0

2 2-0

   1-0

1's	0	1	1	1	1	0	0	0
							1
2's	**0**	**1**	**1**	**1**	**1**	**0**	**0**	**1**

3.	a) Add $1101010_2 + 101101_2$ _____ b) Subtract $1101011_2 - 111010_2$

a. Add $1101010_2+101101_2$

	1	1		1				
		1	1	0	1	0	1	0
			1	0	1	1	0	1
+	1	0	0	1	0	1	1	1

$1101010_2+101101_2$ = **10010111_2**

b. Subtract $1101011_2 - 111010_2$

		0	10	10				
		~~1~~	~~1~~	~~0~~	1	0	1	1
			1	1	1	0	1	0
-		0	1	1	0	0	0	1

$1101011_2 - 111_2$ = **110001_2**

(BOOK INSIDE QUESTIONS & ANSWERS)

1.	**Give ASCII codes for characters A and Z?B** ASCII codes for characters A=65 ; Z=90
2.	**$(8888)_8$ Is it Exactly Octal number? State the reason.**
	❖ No. The numerals used in base 8 are 0 through 7, So 8888 is not a valid base 8 number.

3.	Convert the following Decimal Numbers to its equivalent Binary , Octal, Hexadecimal.		

1) 340_{10}

Decimal –Binary	**octal**	**Hexa decimal**
2 340	8 340	16 340
2 170-0	8 42 - 4	16 21 - 4
2 85-0	5 - 2	1- 5
2 42-1		
2 21-0 .; 340_{10} =**101010100_2**	.; 340_{10}=**524_8**	.; 340_{10} =**154_16**
2 10-1		
2 5-0		
2 2-1		
1-0		

---

4. 11.011_2 Binary to decimal equivalent   (2020)

$(11)_2 = 3$

$2^1 \quad 2^0 \quad . \quad 2^{-1} \quad 2^{-2} \quad 2^{-3}$

1   1   . 0   1   1

$= 3 + . (0 \times 0.5 + 1 \times 0.25 + 1 \times 0.125)$

$= 3.375$

$(11.011)_2 = (3.375)_{10}$

---

5. $- 21_{10} + 5_{10} = (?)_2$

2 21	2 5
2 10-1	2 2-1
2 5-0	1-0
2 2-1	
1-0	

21 $\longrightarrow$ $(10101)_2$ 5 $\longrightarrow$ $(101)_2$

8 bit $\longrightarrow$ 00010101   8 bit $\longrightarrow$ 00000101

1's $\longrightarrow$ 11101010

2's $\longrightarrow$ 11101011

- 21								
1's	1	1	1	0	1	0	1	0
								1
2's	1	1	1	0	1	0	1	1

				1	1	1	1	
-21_{10}	1	1	1	0	1	0	1	1
5_{10}	0	0	0	0	0	1	0	1
+	**1**	**1**	**1**	**1**	**0**	**0**	**0**	**0**

$-21_{10} + 5_{10} = -16_{10} = (11110000)_2$

---

6. (-46)

2 46	(46) $\longrightarrow$ 101110
2 23-0	8 bit $\longrightarrow$ 00101110
2 11-1	1's compliment $\longrightarrow$ 11010001
2 5-1	
2 2-1	
1-0	

						1	
1's	1	1	0	1	0	0	0	1
								1
2's	**1**	**1**	**0**	**1**	**0**	**0**	**1**	**0**

(-46) $\longrightarrow$ **11010010**

7.	Convert the following Decimal Numbers to its equivalent Binary , Octal, Hexa Decimal.

Convert the following Decimal Numbers to its equivalent Binary , Octal, Hexa Decimal.

$(255)_{10} = (?)_2$

Step :1

2 255 $(255)_{10} =$ **(11111111)$_2$**

2 127-1   Step :2   (Binary to Octal)

2 63-1 $(11111111)_2$ $(?)_8$

2 31-1   <u>011</u> <u>111</u> <u>111</u> $(255)_{10} =$ **(377)$_8$**

2 15-1   3   7   7

2 7-1

2 3-1   Step : 3 (Binary to Hexa Decimal)

  1-1 $(11111111)_2$ $(?)_{16}$

                <u>1111</u> <u>1111</u> $(255)_{10} =$ **(FF)$_{16}$**

---

8. Convert (111011)2 into its equivalent decimal number.

Weight	32	16	8	4	2	1
Positional Notation	2^5	2^4	2^3	2^2	2^1	2^0
Given number	1	1	1	<u>0</u>	1	1

                                    = 32+16+8+0+2+1

                                    = $(111011)_2$ = **(59)$_{10}$**

---

9. Binary to Hexa Decimal Conversion:

(1111010110)$_2$ into Hexa Decimal Number.

1111010110 (?)$_{16}$

<u>0011</u>   <u>1101</u>   <u>0110</u>

  3   D   6

$(1111010110)_2$ = **(3D6)$_{16}$**

---

10 Convert the given Binary number into its equivalent Decimal, Octal and Hexa Decimal number.

1011010

1011010(?)$_{10}$

Step:1

Weight	64	32	16	8	4	2	1
Positional Notation	2^6	25	2^4	2^3	2^2	2^1	2^0
Given number	1	<u>0</u>	1	1	<u>0</u>	1	<u>0</u>

              = 64+16+8+2

 $(1011010)_2$ = **(90)$_{10}$**

Step: 2   (Binary to Octal)

1011010 (?)$_8$

<u>001</u> <u>011</u> <u>010</u>

 1   3   2

$(1011010)_2$ = **(132)$_8$**

Step: 3   (Binary to Hexa Decimal)

1011010 (?)$_{16}$

<u>0101</u> <u>1010</u>

 5   A

$(1011010)_2$ = **(5A)$_{16}$**

11	Octal to binary conversion: **472 (?)$_2$** 4 7 2 100 111 010 $472 = (100111010)_2$

12	**Hexa Decimal to Decimal Conversions** **(25F)16 into its equivalent Decimal number**

Weight	256	16	1
Positional Notation	16^2	16^1	16^0
Given number	2	5	F(15)

$(25F)_{16} = 2x256 + 5x16 + 15x1$
$= 512 + 80 + 15$
$(25F)_{16} = (607)_{10}$

13	**Hexa Decimal to Binary Conversions** **(9BC8)$_{16}$ = (?)$_2$** 9 B C 8 1001 1011 1100 1000 $(9BC8)_{16}$ = (**1001101111001000)$_2$**

14	**Binary Addition:** **1010001$_2$+10101$_2$**

		1				1	
	1	0	1	0	0	0	1
			1	0	1	0	1
+	1	1	0	0	1	1	0

$1010001_2 + 10101_2$ = **1100110$_2$**

15	**Binary Subtraction:** **1001010$_2$ - 10100$_2$**

		0	1	10	0	10		
		1̶	0̶	0̶	1̶	0̶	1	0
				1	0	1	0	0
-		0	1	1	0	1	1	0

$1001010_2 - 10100_2$ = **110110$_2$**

16	**(-2$_{10}$) - (-6$_{10}$) = -2$_{10}$ $_+$ 6$_{10}$ = (?)$_2$**

2 2   2 6
  1-0   2 3-0
                                    1-1
 2   ⟶ (10)$_2$ 6   ⟶   (110)$_2$
8 bit ⟶   00000010   8 bit ⟶ 00000110
1's   ⟶   11111101
2's   ⟶   11111110

-2						1	
1's	1	1	1	1	1	1	0	1
							1
2's	1	1	1	1	1	1	1	0

1̶	1	1	1	1	1	1	
-2$_{10}$	1	1	1	1	1	1	1	0
6$_{10}$	0	0	0	0	0	1	1	0
+	0	0	0	0	0	1	0	0

$-2_{10} + 6_{10}$ = 4_{10} = (**00000100)$_2$**

| | BOOK BACK QUESTIONS & ANSWERS |

3. Draw the truth table for XOR gate.

Input		Output
A	B	C
0	0	0
0	1	1
1	0	1
1	1	0

4. Write the associative laws?

❖ $A + (B + C) = (A + B) + C$; $A . (B . C) = (A . B) . C$

1. Write the truth table of fundamental gates. (2020)

AND gate				OR gate				NOT gate	
Input		Output		Input		Output		A	A
A	B	C		A	B	C		0	1
0	0	0		0	0	0		1	0
0	1	0		0	1	1			
1	0	0		1	0	1			
1	1	1		1	1	1			

2. Write a short note on XNOR gate.

XNOR operation $C = A \odot B$

The logical symbol is

5. Write the De Morgan's law.

1) $\overline{A+B} = \overline{A}.\overline{B}$ 2) $\overline{A.B} = \overline{A}+\overline{B}$

1. Explain the fundamental gates with expression and truth table.

❖ There are three fundamental gates namely AND, OR and NOT.

1.AND Gate:

AND gate   C = AND B

AND Operation: C = A.B or C = AB

Example: C = A.B

= 0.0

= 0

Symbol & Truth table for AND Gate:

Symbol	Truth Table		
	A	B	AB
	0	0	0
	0	1	0
	1	0	0
	1	1	1

2.OR Gate:

OR gate   C = A OR B

OR Operation: C = A+B

Example: C = A+B

= 1+1

= 1

Symbol & Truth table for AND Gate:

A	B	A + B
0	0	0
0	1	1
1	0	1
1	1	1
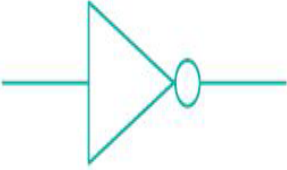
3.NOT Gate:

NOT gate   C = NOT A

NOT Operation: C = $\overline{A}$

Example: if A is 0, C = $\overline{0}$ =1 ; On the other hand, if A is 1, C= $\overline{1}$ = 0

Symbol & Truth table for AND Gate:

A	$\overline{A}$
0	1
1	0

---

2. How AND and OR can be realized using NAND and NOR gate.

(a) Realization of AND function using only the NAND gates $\overline{AB}$ $\overline{\overline{AB}}$ = AB

(b) Realization of OR function using only the NAND gates $\overline{A}$ $\overline{B}$ $\overline{\overline{A}\,\overline{B}}$ = A + B

(d) Realization of AND function using only the NOR gates $\overline{A}$ $\overline{B}$ $\overline{\overline{A} + \overline{B}}$ = AB

(e) Realization of OR function using only the NOR gates $\overline{A + B}$ $\overline{\overline{A + B}}$ = A + B

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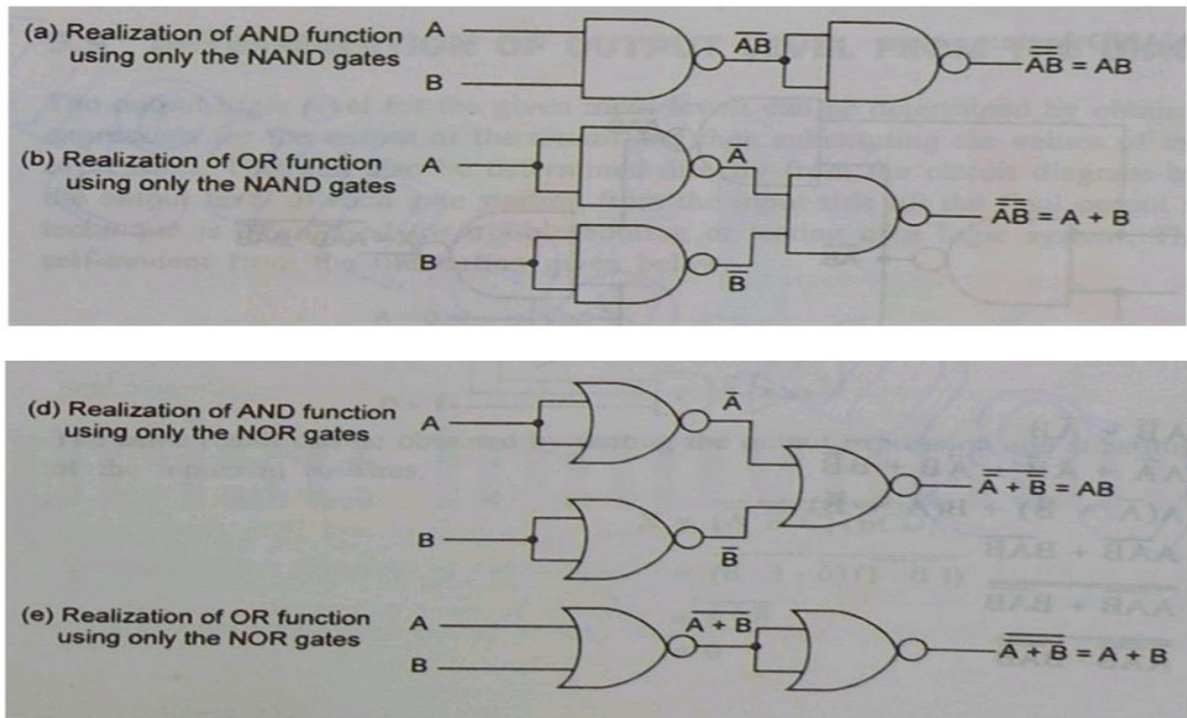
3. Explain the Derived gates with expression and truth table.

NAND Gate:

The logical symbol of NAND gate is
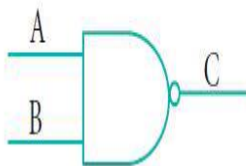
The output of the NAND gate is

$$C = \overline{(A.B)}$$

The truth table for NAND gate is

Input		Output
A	B	C
0	0	1
0	1	1
1	0	1
1	1	0

2. NOR Gate:
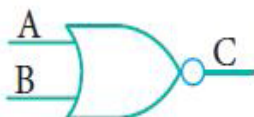
The output of NOR gate is

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

Read this as "C equals NOT of A OR B" or "C equals the complement of A OR B".

Input		Output
A	B	C
0	0	1
0	1	0
1	0	0
1	1	0

3. XOR Gate:

In boolean algebra. exclusive - OR operator ⊕ or "encircled plus".

Hence   C = A ⊕ B

The logical symbol of XOR gate is

Input		Output
A	B	C
0	0	0
0	1	1
1	0	1
1	1	0

4. XNOR Gate:

The logical symbol is

$C = A \odot B$
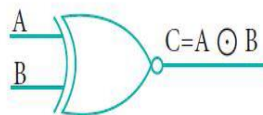
The truth table for XNOR Gate is

Input		Output
A	B	C
0	0	1
0	1	0
1	0	0
1	1	1

(BOOK INSIDE QUESTIONS & ANSWERS)

1. **Theorems of Boolean Algebra**

1) Involution : $\overline{(\overline{A})} = A$ 10) Idempotence : A + A = A, A . A = A

2) Absorption : A + (A . B) = A ,   A . (A + B) = A

3) 3rd Distributive : $A + \overline{A} . B = A + B$ 11) De Morgan's $\overline{A + B} = \overline{A} . \overline{B}$ $\overline{(A . B)} = \overline{A} + \overline{B}$

4) Identity : A + 0 = A A . 1 = A

5) Complement : $A + \overline{A} = 1$; $A . \overline{A} = 0$

6) Commutative : A + B = B + A A . B = B . A

7) Associative : A + (B + C) = (A + B) + C A . (B . C) = (A . B) . C

8) Distributive : A . (B + C) = A . B + A . C A + (B . C) = (A + B) . (A + C)

9) Null Element : A + 1 = 1 ; A . 0 = 0

CHAPTER – 6 SPECIFICATION AND ABSTRACTION

(BOOK BACK QUESTIONS & ANSWERS)

3. **Initially, farmer, goat, grass, wolf = L, L, L, L and the farmer crosses the river with goat. Model the action with an assignment   statement.**

1.   -- farmer, goat, grass, wolf = L, L, L, L

2.   **farmer, goat := R, R**

3.   -- farmer , goat , grass , wolf = R, R, L, L

4.   **farmer := L**

5.   farmer, goat, grass, wolf = L, R, L, L

6.   **farmer, grass := R, R**

7.   -- farmer , goat , grass , wolf = R, R, R, L

8.   **farmer, goat := L, L**

9.   -- farmer, goat, grass, wolf = L, L, R, L

10.   **farmer, wolf := R, R**

11.   **-**- farmer , goat , grass , wolf = R, L, R, R

12.   **farmer : = L**

13.   -- farmer , goat , grass , wolf = L, L, R, R

14.   **farmer , goat : = R, R**

15.   **--** farmer , goat , grass , wolf = R, R, R,

4. **Specify a function to find the minimum of two numbers.**

Answer:

❖ Minimum(A,B)

   --inputs   : A an B are integers (or) Real numbers

   --Outputs: A is minimum (A<B) B is minimum (B<A)

5. **If √2 = 1.414, and the square_root() function returns -1.414, does it violate the   following specification?**

   -- square_root (x)

   -- inputs: x is a real number , x ≥ 0

   -- outputs: y is a real number such that y2=x

Answer:

❖ No, because $(-1.414)^2 = 2$, which satisfies input-output relation ($y^2 = x$

1.	Write the specification of an algorithm hypotenuse whose inputs are the lengths of the two shorter sides of a right angled triangle, and the output is the length of the third side. **Answer:** Hypotenuse (a,b) **--Inputs**: a, b are Real numbers, a > 0, b > 0 **--Outputs**: $c^2 = a^2 + b^2$ where c is real number, c > 0 **Explanation:** a, b – Input Length of the Real number variables c – Length of the Third side.
2.	Suppose you want to solve the quadratic equation $ax^2 + bx + c = 0$ by an algorithm. Quadratic_ solve (a, b, c) -- inputs : ? -- outputs: ? You intend to use the formula and you are prepared to handle only real number roots. Write a suitable specification. **Answer:** Quadratic - solve (a, b, c) -- **inputs :** $b^2 - 4ac > = 0$ where a,b,c are real numbers, $a \neq 0$ -- **outputs:** and x^2 are real numbers such that $a(x1)^2 + bx + c = 0$ and $a(x2)^2 + bx^2 + c = 0$ $$\frac{-b + \sqrt{b^2 - 4ac}}{2a}$$ $$\frac{-b - \sqrt{b^2 - 4ac}}{2a}$$ & $b^2 - 4ac \geq 0$

3.	**Exchange the contents:** Given two glasses marked A and B. Glass A is full of apple drink and glass B is full of grape drink. For exchanging the contents of glasses A and B, represent the state by suitable variables, and write the specification of the algorithm.
	 Answer:
	 ❖ Let us variables a,b,c represent the glass A, glass B and Glass C respectively .
	 ❖ Variables A,B,C can store values APPLE, GRAPE or EMPTY.
	 Initial state: 1.-- a,b,c := Apple, Grape, Empty
	           2. c : = b
	           3.-- a,b,c := Apple, Empty, Grape
	           4. b : = a
	           5.-- a,b,c := Empty, Apple, Grape
	           6. a : = c
	 Final state **7.-- a,b,c := Grape, Apple, Empty**
	 Specification:
	 1.Exchange ( )
	 2. - - inputs : a,b,c := Apple, Grape, Empty
	 3. -- output : a,b,c := Grape, Apple, Empty

	(BOOK INSIDE QUESTIONS & ANSWERS)
1.	**What is the desired relation between the inputs A and B, and the outputs q and r?** The two outputs q (quotient) and r (remainder) should satisfy the property : **A = q X B + r, and** The remainder r should be less than the divisor B, : **0 ≤ r < B**
2.	**Write the specification of an algorithm for computing the square root of a number.** Square_root(n) **- inputs: n is a real number, n ≥ 0.** **-- outputs: y is a real number such that y 2= n.**
3.	**Write the specification of an algorithm to compute the quotient and remainder after dividing an integer A by another integer B. For example,** **divide (22, 5) = 4, 2 divide (15, 3) = 5 , 0** ❖ Let A and B be the input variables. We will store the quotient in a variable q and the remainder in a variable r. So q and r are the output variables.
4	**What are the values of variables m and n after the assignments in line (1) and line (3)?** **M, n := 2 , 5** **-- m, n = ? , ?** **m,n:=m+3,n-1** **-- m, n = ? , ?**

	Answer: The assignment in line (1) stores 2 in variable m, and 5 in variable n. **m=2;n=5** The assignment in line (3) evaluates the expressions m + 3 and n – 1 using the current values of m and n as **m + 3 , n – 1** =2+3,5-1 = **5,4** and stores the values 5 and 4 in the variables m and n, respectively. **m=5 ; n=4** **m, n := 2,5** **-- m, n = 2 , 5** **m, n := m + 3, n – 1 ; -- m, n = 2 + 3, 5-1 = 5, 4**
	### CHAPTER – 7 COMPOSITION AND DECOMPOSITION
	### (BOOK BACK QUESTIONS & ANSWERS)
2.	**Draw a flowchart for conditional statement.**
1.	**For the given two flowcharts write the pseudo code.** **PSEUDO CODE** 1. Start 2. Input A,B 3. If A > B then prints "S1" and "S2" 4. End **PSEUDO CODE** 1. Start 2. Input A,B 3. If A > B then prints "S1" 4. Else print "S2" 5. End
2.	**If C is false in line 2, trace the control flow in this algorithm.** **1 S1** **2 – C is false Answer:** **3 if C **S1;S3; S4 **4 S2** **5 else** **6 S3** **7 S4**
3.	**What is case analysis?** 1. **case C1** 2. **S1** 3. **case C2** 4. **S2** 5. **case** C3 6. **S3**

4.	**Draw a flowchart for -3case analysis using alternative statements.**
5.	**Define a function to double a number in two different ways:** **(1) n + n, (2) 2 x n** 1. double (n) - - Input: n is a real number or integer, n>0 - - Output: y is a real number or an integer such that y = n+n **(2) 2 x n** 2. Double (n) - - Input: n is a real number or integer, n>0 - - Output: y is a real number or an integer such that y = 2xn **Example: Double a value can be done in 2 methods** n=2 (assume) 1) n+n=2+2=4 2) 2xn = 2x2=4
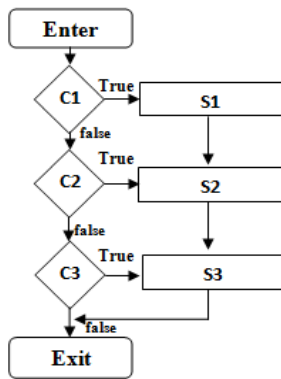
1.	**Exchange the contents: Given two glasses marked A and B. Glass A is full of apple drink and glass B is full of grape drink. Write the specification for exchanging the contents of glasses A and B, and write a sequence of assignments to satisfy the specificaudin.**
	Answer:
	❖ Let us variables a,b,c represent the glass A, glass B and Glass C respectively .
	❖ Variables A,B,C can store values APPLE, GRAPE or EMPTY.
	Specification:
	1.Exchange ( )
	2. - - inputs : a,b,c := Apple, Grape
	3. -- output : a,b,c := Grape, Apple
	Algorithm:
	Initial state: 1.-- a,b,c := Apple, Grape, Empty
	          2. c : = b
	          3.-- a,b,c := Apple, Empty, Grape
	          4. b : = a
	          5.-- a,b,c := Empty, Apple, Grape
	          6. a : = c
	Final state 7.-- a,b,c := Grape, Apple, Empty

2.	**Circulate the contents: Write the specification and construct an algorithm to circulate the contents of the variables A, B and C as shown below: The arrows indicate that B gets the value of A, C gets the value of B and A gets the value of C.** **Specifications:** 1. Circulate 2. -- inputs : a,b,c := A,B,C 2. -- outputs: a,b,c := C,A,B **Algorithm:** 1. circulate (a,b,c) 2. -- a,b,c := A,B,C 3. temp := c 4. c:=b 5. b:=a 6. a: =temp 7. -- a,b,c:= C,A,B
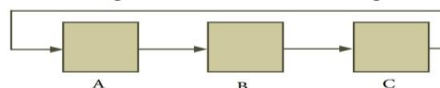
3.	Decanting problem. You are given three bottles of capacities 5 ,8, and 3 liters. The 8L bottle is filled with oil, while the other two are empty. Divide the oil in 8L bottle into two equal quantities. Represent the state of the process by appropriate variables. What are the initial and final states of the process? Model the decanting of oil from one bottle to another by assignment. Write a sequence of assignments to achieve the final state.

(a) MODEL
Let a,b,c be the variables whose maximum values are 8L,5L and 3L respectively.
<u>Initial state: a,b,c: 8,0,0</u>

Bottle 1 = 8L	Bottle 2= 5L	Bottle 3 =3L
a	b	c

<u>Final state: a,b,c:= 4,4,0</u>

Bottle 1 = 8L	Bottle 2= 5L	Bottle 3 =3L
a	b	c

(b) Specification:
decant
-- inputs : a,b,c := 8,0,0
-- outputs: a,b,c := 4,0,0

(c)Algorithm:
Let us assume that a:=b denotes oil in b is poured into a bottle until either "a" is full or "b" becomes empty.
decant (a ,b ,c)

-- a ,b ,c : 8,0,0	-- a ,b ,c : 3,5,0	-- a ,b ,c : 3,2,3	-- a ,b ,c : 6,2,0	-- a ,b ,c : 6,0,2
b: = a	c: = b	a: = c	c : = b	b: = a

-- a ,b ,c : 1,5,2	-- a ,b ,c : 1,4,3	-- a ,b ,c : 4,4,0
a: = c	a: = c	

4.	Trace the step-by-step execution of the algorithm for factorial (4).

factorial(n) -- inputs : n is an integer , $n \geq 0$ -- outputs : f = n!
f, i := 1 ,1   while $i \leq n$ f, i := $f \times i$, i+1

Algorithm trace:

f=1 i=1	f=f*i	i=i+1
1st iteration	f=1x1=1	i=1+1=2
2nd iteration	f=1x2=2	i=2+1=3
3rd iteration	f=2x3=6	i=3+1=4
4th iteration	f=6x4=24	i=4+1=5

(BOOK INSIDE QUESTIONS & ANSWERS)

1.	What are the values of variables m and n after the assignment in line (1) and line (3)

(1) m,n:4,10
(2) - -m,n=?,?
(3) m,n:=m+5,n-2
(4) - -m,n=?,?
<u>Answer:</u>
= m+5
=4+5= 9
  n-2
= 9-2 =8
<u>ans</u>: **9,8**

6.	**Define factorial of a natural number recursively.**
	❖ "The **factorial** of a **number** is the product of all the integers from 1 to that **number**."
	 - - inputs : n
	 - - outputs: fact = n!
	if (n= 0) - - base case
	        1
	else
	n*factorial (n-1) - -recursion step.

1.	**There are 7 tumblers on a table, all standing upside down. You are allowed to turn any 2 tumblers simultaneously in one move. Is it possible to reach a situation when all the tumblers are right side up? (Hint: The parity of the number of upside down tumblers is invariant.)**
	Answer
	❖ Let's assume,
	❖ u – No. of tumblers right side up
	❖ v – No. of tumblers upside down
	INITIAL STAGE : u = 0,v = 7 (All tumblers upside down)
	FINAL STAGE OUPUT : u = 7,v = 0 (All tumblers right side up)
	POSSIBLE ITERATIONS:
	1) Turning both upside down tumblers to right side up
	    u = u+2, v = v-2 [u is even]
	2) Turning both right side up tumblers to upside down
	    u = u-2, v = v+2 [u is even]
	3) Turning one right side up tumblers to upside down and other tumbler from upside
	    down to right side up.
	    u = u+1-1 = u , v = v+1-1=v [u is even]
	❖ Initially u=0 and continuous to be even in all the three cases.
	❖ Therefore u is always even.
	INVARIANT:
	❖ u is even
	❖ But in the final stage (Goal), u= 7 and v = 0 i.e u is odd
	❖ Therefore it is not possible to reach a situation where all the tumblers are right side up.

2.	**A knockout tournament is a series of games. Two players compete in each game; the loser is knocked out (i.e. does not play any more), the winner carries on. The winner of the tournament is the player that is left after all other players have been knocked out. Suppose there are 1234 players in a tournament. How many games are played before the tournament winner is decided?** **Answer:** | No.of players(r)	2	3	4	5	n	1234
---	---	---	---	---	---	---

No.of games(n)	1	2	3	4	n-1	1234-1 = 1233	
							
							Explanation:
							After every game, r will be reduced by 1.
							If r =2 then n = 1
							As n increases, r decreases. So, n,r:=n+1, r-1
							n+r = (n+1)+(r-1)
							        n+1+r-1
							      n+r
							Therefore n+r is invariant.
							n+r = 1234 (No.of players initially)
							❖ The winner (only one player) of the tournament that is left after all other players have been knocked out.
							i.e n = 1
							n+r = 1234
							1+r = 1234
							r = 1234-1 = 1233

3.	King Vikramaditya has two magic swords. With one, he can cut off 19 heads of a dragon, but after that the dragon grows 13 heads. With the other sword, he can cut off 7 heads, but 22 new heads grow. If all heads are cut off, the dragon dies. If the dragon has originally 1000 heads, can it ever die? (Hint:The number of heads mod 3 is invariant.)

Answer:
- ❖ No.of heads of dragon = 1000
- ❖ Sword 1 = cuts 19 heads but 13 heads grow back.
- ❖ Sword 2 = cuts 7 heads but 22 heads grow back.
- ❖ n = number of heads of the dragon at initial state.

Case 1: King uses Sword 1
n:= n-19+13
   n-6
No.of heads are reduced by 6.

Case 2: King uses Sword 2
n:= n-7+22
   n+15
No.of heads are increased by **15.**

1.	Assume an 8 × 8 chessboard with the usual colouring. "Recoloring" operation changes the colour of all squares of a row or a column. You can recolor repeatedly. The goal is to attain just one black square. Show that you cannot achieve the goal.

Answer:
In a chess board no .of squares in any row or column =8
Total no .of squares   = 8x8=64
No .of block squares   = 32
No .of white squares   =32
Let no .of blacks in a selected recoloring row or column = b
No .of black squares after recoloring operation   = 8-b
Initial state   b =32
Desired state   b=1
Let us tabulate all the possible outcomes after recoloring a row or column .

No .of Block squares in a row or column Before recoloring (b)	No .of Block squares in a row or column Before recoloring (-b)	Difference = | b-(8-b) |	Difference (even or odd)
1	7	6	even
2	6	4	even
3	5	2	even
4	4	0	**Zero (even)**
5	3	2	even
6	2	4	even
7	1	6	even

2.	Power can also be defined recursively a

$$a^n= \begin{cases} 1 & \text{if } n = 0 \\ a \times a^{n-1} & \text{if n is odd} \\ a^{n/2} \times a^{n/2} & \text{if n is even} \end{cases}$$

Construct a recursive algorithm using this definition.
How many multiplications are needed to calculate a10?

Answer:
Power (5,2) = 5 X 5 = 25
Power (a, n) raise a to the power n.

Algorithm:
Power (a,n)
if n=0 – base case
  1
else   -- recursion step
 if n is odd
  a * power (a, n-1)
else
  p = power (a, n/2)
  p*p

TO FIND a^{10}
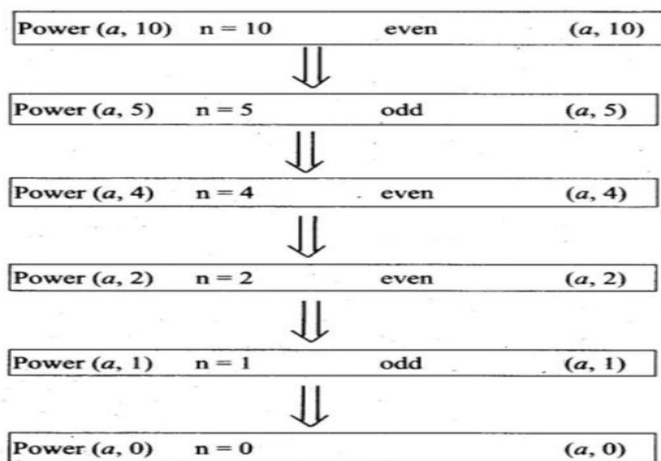
3.	A single-square-covered board is a board of 2n x 2n squares in which one square is covered with a single square tile. Show that it is possible to cover the this board with triominoes without overlap.

Answer:

size of the board $= 2n^n \times 2^n$
Number of squares $= 2^n \times 2^n = 4^n$
Number of squares covered $= 1$
Number of squares to be covered $= 4^n - 1$
$4^n - 1$ is a multiple of 3
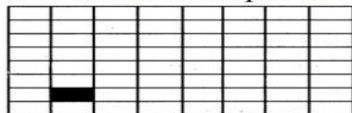
Case 1: n = 1
The size of the board 2 x 2
One triominoe can cover 3 squares without overlap.

We can cover it with one triominoe and solve the problem.

2x2 square	Triominoe	Triominoe covered square

Case 2: $n \geq 2$
1. Place a triominoe at the center of the entire board so as to not cover the covered sub – board.
2. One square in the board is covered by a tile. The board has 4 sub – boards of size $2^{2n-1} \times 2^{2n-1}$.
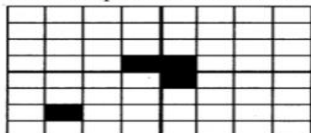
Out of 4 sub – boards one sub – board is a single square covered sub – board.
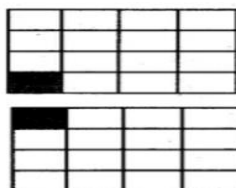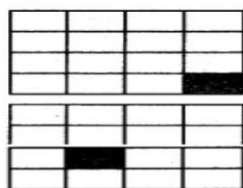
One triominoe can cover remaining three sub – boards into single square covered sub – board.
The problem of size n is divided into 4 sub – problems of size (n – 1).
Each sub – board has $2^{2n-1} \times 2^{2n-1} - 1 = 2^{2n-2} - 1 = 4^{n-1} - 1$ squares to be covered.
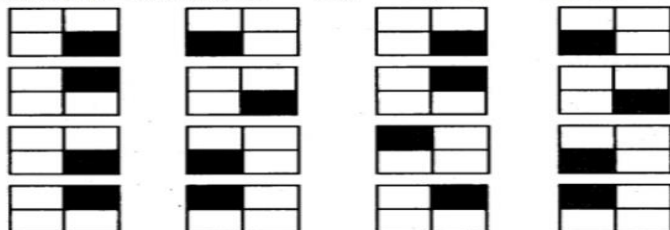
$4^{n-1} - 1$ is also a multiple of 3
In this, the $2^n \times 2^n$ board is reduced to boards of size 2×2 having are square covered.
A triominoe can be placed in each of these boards and hence the whole original $2^n \times 2^n$ board is covered with triominoe without overlap.

	(BOOK BACK QUESTIONS & ANSWERS)
3.	**The following constants are of which type?**
	(i) 39 - Integer constants **(ii) 032** - Octal constants
	(iii) 0XCAFE - Hexadecimal constants **(iv) 04.1 4** - Floating Point constants
4.	**Write the following real constants into the exponent form:**
	(a) 23.197 - 0.23197×10^2 **0.23197E02** **(b) 7.214** - 0.7214×10^1 **0.7214E01**
	(c) 0.00005 - 0.5×10^{-4} **0.5E-04** **(d) 0.319** - 0.0319×10^1 **0.0319E01**
5.	**Assume n=10; what will be result of n++ and - - n; ?**
	Answer: n++=n = 10+1 = 11 ; - -n; = n=1 = 10 – 1 = 9
	BOOK INSIDE QUESTIONS & ANSWERS)
1.	**What kind of constants are following?**
	(i) 26 - Integer constants **(ii) 015** - Octal constants
	(iii) 0XE - Hexadecimal constants **(iv) 014.9** - Floating Point constants
2.	**Write the following real constants in fractional form:**
	1) 0.23E4 - 0.0023 **2) 0.517E-3** - 517 **3) 0.5E-5** - 50000
3.	**If a = 65, b = 15, then find. 1) a&b 2) a^b**
	Answer: If a = 65 , b = 15; Equivalent binary values of 65 = 0100 0001 ; 15 = 0000 1111
1.	**Write output of the C++ program.** **OUTPUT:**
	#include <iostream> Welcome to programming in C++
	using namespace std;
	int main()
	{
	cout << "Welcome to programming in C++ ";
	return 0;
	}

1. **Binary operators examples .**

1.Arithmetic Operators:

Operator	Operation	Example
+	Addition	10 + 5 = 15
–	Subtraction	10 – 5 = 5
*	Multiplication	10 * 5 = 50
/	Division	10 / 5 = 2 (Quotient of the division)
%	Modulus (To find the reminder of a division)	10 % 3 = 1(Remainder of the division)

2.Relational Operators:

Operator	Operation	Example
>	Greater than	a > b
<	Less than	a < b
>=	Greater than or equal to	a >= b
<=	Less than or equal to	a <= b
==	Equal to	a == b
!=	Not equal	a != b

3.Logical Operators:

Operator	Operation	Description
&&	AND	The logical AND combines two different relational expressions in to one. It returns 1 (True), if both expression are true, otherwise it returns 0 (false).
||	OR	The logical OR combines two different relational expressions in to one. It returns 1 (True), if either one of the expression is true. It returns 0 (false), if both the expressions are false.
!	NOT	NOT works on a single expression / operand. It simply negates or inverts the truth value. i.e., if an operand / expression is 1 (true) then this operator returns 0 (false) and vice versa

4.Bitwise Operators:

❖ 3 kinds of 1.Logical bitwise   2.Bitwise shift 3.One's complement

5.Assignment Operator:

Operator	Name of Operator	Example
+=	Addition Assignment	a = 10; c = a += 5; c = 15
- =	Subtraction Assignment	a = 10; c = a -= 5; c = 5
*=	Multiplication Assignment	a = 10; c = a *= 5; c = 50
/=	Division Assignment	a = 10; c = a /= 5; c = 2
%=	Modulus Assignment	a = 10; c = a %= 5; c = 0

6.Conditional Operator:

In C++, there is only one conditional operator is used. **?:** is a conditional Operator. This is a Ternary Operator.

1. **Assume a= 15, b = 20;**

What will be the result of the following operations? a) a & b   b) a│b   c) a ^ b   d) a >> 3   e) (~b)

Answer :

a) a & b   = $(00000100)_2$ = **$(4)_{10}$**   b) a│b   = $(00011111)_2$ = **$(31)_{10}$**

c) a ^ b   = $(00011011)_2$ = **$(27)_{10}$**   d) a >> 3   = $(00000001)_2$ = **$(1)_{10}$**   e) (~b)   = $(00001011)_2$ = **$(11)_{10}$**

EVALUATE YOURSELF -1

2. **What kind of constants are following? i) 26 ii) 015 iii) 0xF iv) 014.9**

i) 26 - Decimal ii) 015-Octal iii) 0xF-Hexa decimal iv) 014.9-Decimal

4. **Write the following real constants into exponent form: i) 32.179 ii) 8.124 iii) 0.00007**

i) $32.179 = 0.32179 \times 10^2 = 0.32179E2$

ii) $8.124 = 0.8124 \times 10^1 = 0.8124E1$

iii) $0.00007 = 0.7 \times 10^4 = 0.7E-4$

5. **Write the following real constants in fractional form: i) 0.23E4 ii) 0.517E-3 iii) 0.5E-5**

i) $0.23E4 = 0.23 \times 10^4 = 0.2300.00 = 2300$

ii) $0.517E-3 = 0.57 \times 10^{-3} = 0.000517$

iii) $0.5E-5 = 0.5 \times 10^{-5} = 0.000005$

EVALUATE YOURSELF -2

3. **What does the modulus operator % do?**

The modulus % operator is used to find the remainder of the division.

Example: 10%3 = 1 (Remainder of the division)

4. **What will be the result of 8.5 % 2?**

Compilers throws the error "Invalid operand type.

5. **Give that i = 8, j = 10, k = 8, What will be result of the following expressions?**

(i) i < k = 8<8 (false) or 0   (ii) i < j = 8<10 (true) or 1

(iii) i > = k = 8>=8 (true) or 1   (iv) i = = j = 8==10(false) or 0   (v) j ! = k = 10!=8(true) or 1

7. **Write an expression involving a logical operator to test, if marks are 75 and grade is 'A'.**

if(Marks ==75)&&(grade =='A')

CHAPTER – 9 (PART – 2) Data Types, Variables and Expressions

(BOOK BACK QUESTIONS & ANSWERS)

7. **Determine which of the following are valid constant? And specify their type.**

 (i) 0.5   - Valid Floating Constant

(ii) 'Name' - Invalid String Constant   (Enclosed within Double quotes)

(iii) '\t'   - Valid - Non graphic Character data type

(iv) 27,822 - Invalid Decimal Constant   (Commas is not allowed)

8. **Suppose x and y are two double type variable that you want add as integer variable.   Construct a C++ statement to do the above.   Answer: double x = 11.5; y = 3.5; int a; a = int (x) + int (y);**

9. **What will be the result of following if num=6 initially.**

(a) cout << num;   ⟶   6 ; (b) cout << (num==5);   ⟶ 0 (False)

10 **Which of the following two statements are valid? Why?**

Also write their result. Int a;   (i) a = 3,014; (ii) a=(3,014);

❖ Above the two statements is **Invalid.**

❖ Special Symbols are not allowed in the integer values

   (Commas, Open and Close Brackets)

3.	**Evaluate the following C++ expressions where x, y, z are integers and m, n are floating point numbers. The value of x = 5, y = 4 and m=2.5;** **(i) n = x + y / x; (ii) z = m * x + y; iii) z = (x++) * m + x;** n=5+4/5 =2.5*5+4 =5*2.5+x = 5+0 =12.5+4 =12.5+5 = 17.5 **n=5** **z=16** **z=18**
	EVALUATE YOURSELF 4&5
5.	**What is wrong with the following statement?** const int x; In this statement the value for 'x' is not assainged. Cons int x =10;
2.	**What is the difference between endl and \n?** Endl –Inserts a new line and flushes the buffer ; '\n' – Inserts only a new line.
	CHAPTER – 10 FLOW OF CONTROL
	(BOOK BACK QUESTIONS & ANSWERS)

3.	**Correct the following code segment:**
	  if (x=1) if(x= =1)
	    p= 100; p=100;
	  else else
	    p = 10; p=10;

4.	**What will be the <u>output</u> of the following code:** **int year; cin >> year; if (year % 100 == 0) if (year % 400 == 0)** **cout << "Leap"; else cout << "Not Leap year";** <u>**Answer:**</u> **(i) 2000** - Leap **(ii) 2003** - Not Leap Year **(iii) 2010** - Not Leap Year
5.	**What is the <u>output</u> of the following code? for (int i=2; i<=10 ; i+=2) cout << i;** <u>**Answer:**</u> <u>Output :</u> 2 4 6 8 10
6	**Write a <u>for loop</u> that displays the number from 21 to 30.** int i; for (i=21; i < = 30 ; i ++) cout << i; return 0;

7.	**Write a <u>while loop</u> that displays numbers 2, 4, 6, 8.......20.**
	int i=2;
	while (i<=20)
	{
	cout << i<<"\t";
	i+=2;
	}
	return 0;

1.	**Convert the following if-else to a single conditional statement: if (x >= 10) a = m + 5; else a = m;** <u>**Answer :**</u> a=(x> =10)? m+5: m;
2.	**Rewrite the following code so that it is functional:** **v = 5;** int v=5; **do;** do **{** { **total += v;** total+=v; **cout << total;** cout<<total; **while v <= 10** v++; } while (v<=10);

3.	**Write a C++ program to print multiplication table of a given number.**
	#include<iostream> **Output :**
	using namespace std; Enter Number To Find Multiplication table 3
	int main() 3x1=3 3x2=6 3x3=9 3x4=12 3x5=15
	{ 3x6=18 3x7=21 3x8=24 3x9=27 3x10=30
	int num;
	cout<<"Enter Number To Find Multiplication table ";
	cin>>num;
	for(int a=1;a < =10; a++)
	{
	cout<<num<<" * "<<a<<" = "<<num*a<<endl;
	} return 0; }

4.	**Write the syntax of switch statement.**
	Syntax:
	switch(expression)
	{
	case constant 1:
	statement(s);
	break;
	case constant 2:
	statement(s);
	break;
	- - -
	- - -
	default:
	statement(s);
	}

5.	**Write a short program to print following series: a) 1 4 7 10...... 40**
	#include<iostream>
	using namespace std;
	int main() **Output:**
	{ 1 4 7 10 13 16 19 22 25 28 31 34 37 40
	int n;
	for(int i=1;i<=40,i+=3)
	cout<<i<< "\t";
	getch ( );
	}

2.	**Entry control loop: (for loop)**
	Syntax :
	for (initialization(s); test-expression; update expression(s))
	{
	Statement 1;
	Statement 2
	………….
	}
	Statement-x;
	Flow chart :
	
	Example : **Output:**
	#include <iostream> value of I : 0
	using namespace std; value of I : 1
	int main () value of I : 2
	{ value of I : 3
	int I; value of I : 4
	for(I = 0; i< 5; I ++)
	cout<< "value of I : " <<i<<endl;
	return 0;
	}

3.	**Write a program to find the LCM and GDC of two numbers.**

```
#include<iostream>
using namespace std;
int main( )
{
int n1,n2,a,b,gcd,lcm;
cout<<"Enter two numbers"<<endl;
cin>>n1>>n2;
a=n1;
b=n2;
while(n1!=n2)
{
if(n1>n2)
n1=n1-n2;
else
n2=n2-n1;
}
gcd=n1;
cout<<"GCD="<<gcd;
lcm=(a*b)/gcd;
cout<<"LCM="<<lcm;
}
```

Output:

Enter two numbers : 20   30

GCD : 10 LCM = 60

4.	**Write programs to find the sum of the following series:**

(a) $X- \dfrac{x^2}{2!}+\dfrac{x^3}{3!}+\dfrac{x^4}{4!}+\dfrac{x^5}{5!}+\dfrac{x^6}{6!}$

(b) $X+ \dfrac{x^2}{2}+\dfrac{x^3}{3}+\ldots\ldots+\dfrac{x^n}{n}$

```
#include <iostream>
#include<conio.h>
#include<math.h>
using namespace std;
int fact(int n)
{
int f=1;
for(int i=1;i<n;i++)
f*=I;
return f;
}
int main()
{
Int x,s=1;
Float sum=0;
cout<< "Enter the value for x:";
cin>>x;
for(int i=1;i<=6;i++)
{
sum=sum+s*(pow(x,i)/fact(i));
s*=-1;
}
Cout<<"Sum of series is "<<sum<<endl;
getch();
return 0;
}
```

```
#include <iostream>
#include<conio.h>
#include<math.h>
using namespace std;
int main()
{
int  x, n;
float sum=0;
cout<<"Enter the value of x:";
cin>>x;
cout<<"Enter number of terms:";
cin>>n;
for(i=1;i<=n; i++)
sum= sum+pow (x,i) /i;
cout<<"Sum of  series is:"<<sum<<endl;
getch();
return 0;
}
```

5.	**Write a program to find sum of the series. $S = 1 + x + x^2 +..... + x^n$**

```
#include <iostream>
#include<conio.h>
#include<math.h>
using namespace std;
int main()
```

```
{
int x, n;
float sum=0;
cout<<"Enter the value of x:";
cin>>x;
cout<<"Enter the number of terms:";
cin>>n;
for(i=1;i<=n; i++)
sum= sum+pow (x,i)
cout<<"Sum of series is:"<<sum<<endl;
getch();
return 0;
}
```

	(BOOK INSIDE QUESTIONS & ANSWERS)

1.	**Write a <u>while loop</u> that displays numbers 5, 10, 15, ...50. (2019)**
	int i=5;
	while (i<=50)
	{
	cout << i<<',' ;
	i+=5;
	}

2.	**Write a <u>while loop</u> that displays numbers 3, 16, 9, 12 ....30**
	int i=3;
	while (i<=30)
	{
	cout << "\n"<<i ;
	i+=3;
	}

4	**Write the syntax and example of if statement (2020)**
	<u>Syntax:</u>
	if (expression)
	        true-block;
	statement-x;
	<u>Example :</u>
	#include <iostream>
	using namespace std;
	int main()
	{
	int age;
	cout<< "\n Enter your age: ";
	cin>> age;
	if(age>=18)
	cout<< "\n You are eligible for voting ....";
	cout<< "This statement is always executed.";
	return 0;
	}

1.	**Write a short program to print following series: a) 1 3 5 7...... 75**
	#include<iostream.h>
	using namespace std;
	int main()
	{
	for(int i=1;i<=75,i+=2)
	cout<<i<< endl;
	getch ( );
	}

2.	What are the key differences between if… else and switch statements in c++ ? (2020)	
	if… else	**Switch statements**
	Syntax	**Syntax:**
	if (expression)	switch(expression)
	{	{
	True-block;	case constant 1:
	}	statement(s);
	else	break;
	{	case constant 2:
	false-block;	statement(s);
	}	break; . . . .
	Statement-x	default:
	Example:	statement(s);
	#include<iostream>	}
	using namespace std;	**Example:**
	int main()	#include<iostream>
	{	using namespace std;
	int num, rem;	int main()
	cout<< "\n Enter a number: ";	{ int num;
	cin>>num;	cout << "\n Enter week day number: ";
	rem = num % 2;	cin >> num;
	if (rem==0)	switch (num)
	cout<< "\n The given number"	{
	<<num<< " is Even";	case 1 : cout << "\n Sunday"; break;
	else	case 2 : cout << "\n Monday"; break;
	cout<< "\n The given number	case 3 : cout << "\n Tuesday"; break;
	"<<num<< " is Odd"; return 0;	break; default: cout << "\n Wrong
	}	input....";
		} }

	CHAPTER – 11 FUNCTIONS
	(BOOK BACK QUESTIONS & ANSWERS)

2.	**Write about strlen() function.**
	General form : **Example:** name= "Tamil strlen(name); [**length of the name = 5**]
	Strlen(string)

1.	**Call by value method Example Program:** **Output :**
	#include<iostream> Enter the Value for A : 5
	using namespace std; The Value inside display function (a * a) : 25
	void display(int x) The Value inside main function 5
	{
	int a=x*x;
	cout<<"\n\n The Value inside display function (a * a):"<<a;
	}
	int main()
	{
	int a;
	cout<<"\n\n Enter the Value for A :";
	cin>>a;
	display(a);
	cout<<"\n\n The Value inside main function "<<a;
	return(0);
	}

2.	**What is Recursion? Write a program to find GCD using recursion.** **Output:**
	#include <iostream> Enter a number to find its factorial: 5
	using namespace std; Factorial of Number 5 = 120
	int factorial(int); // Function prototype //
	int main()
	{

```
int no;
cout<<"\nEnter a number to find its factorial: ";
cin >> no;
cout << "\nFactorial of Number " << no <<" = " << factorial(no);
return 0;
}
int factorial(int m)
{
if (m > 1)
{
return m*factorial(m-1);
}
else
{
return 1;
}
}
```

3.	**What are the different forms of function return? Explain with example.**

1. The return statement:
Syntax: return expression / variable;
Example : return(a+b); return(a); return;
2. The Returning values:
Example :
```
int add (int, int);
add (int, int);
```
3. The Returning by reference: **Output:**

```
#include<iostream>
using namespace std;
int main()
{
int n1=150;
int &n1ref=n1;
cout<<"\n The Value of N1 = "<<n1<<" and n1Reference = "<<n1ref;
n1ref++;
cout<<"\n After n1 increased the Value of N1 = "<<n1;
cout<<" and n1Reference = "<<n1ref;
return(0);
}
```

Output:
The Value of N1 = 150 and n1Reference = 150
After n1 increased the Value of N1 = 151 and n1Reference = 151

5.	**Write a program to accept any integer number and reverse it.** **Output**

```
#include <iostream>
#include<iostream>
using namespace std;
int main()
{
int num, r, rev=0;
cout << "Enter a positive integer: ";
cin >> num;
while(n >0)
{
r=n%10;
num=num*10+r;
n=n/10;
}
cout << " The Reversed Number  is:"<< rev;
getch();
return 0;
}
```

Output
Enter a number: 123
Reversed number: 321

3.	**What is the syntax to declare two – dimensional array. (2019)** The declaration of a 2-D array is : data-type array_name[row-size][col-size];

5.	**What is the error in the following structure definition.**
	struct employee{ inteno;charename[20];char dept;} Employee e1,e2;
	struct employee
	{
	int eno;
	char ename[20];
	char dept;
	}
	employee e1,e2;

3.	**The following code sums up the total of all students name starting with 'S' and display it.Fill in the blanks with required statements.**
	Struct student{int exam no,lang,eng,phy,che,mat,csc,total;char name[15];}**;**
	int main()
	{
	student s[20];
	for(int i=0;i<20;i++)
	{
	Cout<<"enter the students name one by one:";
	Cin>>name[i];
	}
	for(int i=0;i<20;i++)
	{
	if(name[0]=='s')
	Cout<<name[i];
	}
	return 0;
	}

1.	**Write a C++ program to find the difference between two matrix.** `#include<iostream>` **Output :** `using namespace std;` Enter 3*3 Array 1 Elements : `int main()` 5 `{` 6 `clrscr();` 7 `int arr1[3][3], arr2[3][3], arr3[3][3], sub, i, j;` 8 `cout<<"Enter 3*3 Array 1 Elements:\n";` 9 `for(i=0; i<3; i++)` 4 `{` 3 `for(j=0; j<3; j++)` 2 1 `{` Enter 3*3 Array 2 Elements : `cin>>arr1[i][j];` 1 `}` 2 `}` 3 `cout<<"Enter 3*3 Array 2 Elements:\n";` 4 `for(i=0; i<3; i++)` 5 `{` 0 `for(j=0; j<3; j++)` -1 `{` -2 `cin>>arr2[i][j];` -3 `}` Difference between two matrix `}` 4 4 4 `cout<<"Difference between two matrix ... \n";` 4 4 4 `for(i=0; i<3; i++)` 4 4 4 `{`

| | ```
for(j=0; j<3; j++)
{
cout<<arr3[i][j]<<" ";
}
cout<<"\n";
}
return 0;
}
``` |
| 2. | **Write a C++ program to add two distances using the following structure definition**
struct Distance
{
int feet; float inch
}
d1 , d2, sum;
<u>**Answer:**</u> |

```
#include <iostream>                         Output:
using namespace std;                        Enter 1st distance
struct Distance                             Enter feet: 6
{                                           Enter inch: 3.4
int feet;                                   Enter information for 2nd distance
float inch;                                 Enter feet: 5
}                                           Enter inch: 10.2
d1 , d2, sum;                               Sum of distances = 12 feet 1.6 inches
int main()
{
cout << "Enter 1st distance" << endl;
cout << "Enter feet: ";
cin >> d1.feet;
cout << "Enter inch: ";
cin >> d1.inch;
cout << "\nEnter information for 2nd distance" << endl;
cout << "Enter feet: ";
cin >> d2.feet;
cout << "Enter inch: ";
cin >> d2.inch;
sum.feet = d1.feet+d2.feet;
sum.inch = d1.inch+d2.inch;
if(sum.inch > 12)
{
++ sum.feet;
sum.inch -= 12;
}
cout << endl << "Sum of distances = " << sum.feet << " feet " << sum.inch << " inches";
return 0;
}
```

3.	**Write the <u>output</u> of the following c++ program.**			**Output**

```
#include<iostream>                                Details of Book No 1
#include<stdio>                                   Book Name : Programming
#include <string>                                 Book Author : Dromy
#include<conio>                                   Details of Book No 2
using namespace std;                              Book Name : C++ Programming
struct books {                                    Book Author : BjarneStroustrup
char name[20], author[20];
} a[50];
int main()
{
clrscr();
```

S.no	**Book Name**	**Author**
1.	Programming	Dromy
2.	C++ Programming	BjarneStroustrup

```
cout<< "Details of Book No " << 1 << "\n";
cout<< "-----------------------\n";
cout<< "Book Name :"<<strcpy(a[0].name,"Programming ")<<endl;
cout<< "Book Author :"<<strcpy(a[0].author,"Dromy")<<endl;
cout<< "\nDetails of Book No " << 2 << "\n";
cout<< "-----------------------\n";
cout<< "Book Name :"<<strcpy(a[1].name,"C++programming" )<<endl;
cout<< "Book Author :"<<strcpy(a[1].author,"BjarneStroustrup ")<<endl;
cout<<"\n\n";
cout<< "===============================================\n";
cout<< " S.No\t| Book Name\t|author\n";
cout<< "===============================================";
for (int i = 0; i < 2; i++) {
cout<< "\n " << i + 1 << "\t|" << a[i].name << "\t| " << a[i].author;
}
cout<< "\n===============================================";
return 0;
}
```

4.	**Write the <u>output</u> of the following c++ program.**	**<u>Output:</u>**

```
#include <iostream>                                          First Student
#include <string>                                            Roll no: 1
using namespace std;                                         Name: Brown
struct student                                               Phone no: 123443
{                                                            Second Student
introll_no;                                                  Roll no: 2
char name[10];                                               Name: Sam
long phone_number;                                           Phone no: 1234567822
};
int main(){
student p1 = {1,"Brown",123443},p2;
p2.roll_no = 2;
strcpy(p2.name ,"Sam");
p2.phone_number = 1234567822;
cout<< "First Student" <<endl;
cout<< "roll no : " << p1.roll_no <<endl<< "name : " << p1.name <<endl;
cout<< "phone no : " << p1.phone_number <<endl;
cout<< "Second Student" <<endl;
cout<< "roll no : " << p2.roll_no <<endl<< "name : " << p2.name <<endl;
cout<< "phone no : " << p2.phone_number <<endl;
return 0;
}
```

5.	<u>**Debug the error in the following program**</u>	<u>**CORRECT CODE**</u>
	1. #include <istream.h>	1.#include<iostream>
	2. structPersonRec	2.using namespace std;
	3. {	3.strct PersonRec
	4. charlastName[10];	4.{
	5. chaefirstName[10];	5. string firstName[10];
	6. int age;	6. string firstName[10];
	7. }	7.int age[10];
	8. PersonRecPeopleArrayType[10];	8.};
	9. void main()	9.int main()
	10. {	10.{
	11. PersonRecord people;	11. PersonRec people;
	12. for(i = 0; i < 10; i++)	12.for (int i=0; i<4;i++)
	13. {	13. {
	14. cout<<people.firstName<< ' ' <<people.lastName <<people.age;	14. cout<< "Enter first name: ";
	15. }	15.cin >>people.firstName[i];

```
16.   for (int i = 0; i < 10; i++)                16. cout<< "Enter last name: ";
17.   {                                           17.cin >>people.lasttName[i];
18.   cout<< "Enter first name: "; cin<<peop[i].firstName;   18.cout<<"Enter age:";
19.   cout<< "Enter last name: "; cin>>peop[i].lastName;    19.cin>>people.age[i];
20.   cout<< "Enter age: "; cin>> people[i].age;}   20.}
21.   }                                           21.for (int i=0;  i<4;i++)

22.cout<<people.firstName[i]<<'\t'<<people.last[i]<<'\t'<<people.age[i]<<'\n';
23.}
24. return 0;
25. }
```

CHAPTER – 14 Classes and objects

(BOOK BACK QUESTIONS & ANSWERS)

1.	**Rewrite the following program after removing the syntax errors if any and underline the errors:**

<div style="display:flex">

Left column:
```
#include<iostream>
#include<stdio.h>
classmystud
{ intstudid =1001;
Char name[20];
{ }
void register ( ) {cin>>stdid;gets(name);
}
void display ( )
{ cout<<studid<<": "<<name<<endl;}
}
int main( )
{ mystud MS;
register.MS( );
MS.display( );
}
public
mystud( )
```

Right column:
```
#include<iosream>
 #include<stdio.h>
 using namespace std;
 class mystud
 {
 int studid;
   char name[20];
 public:
   mystud()
   {
  studid=1001;
    }
   void reg()
    {
  cout<<"Enter the name:";
   gets(name);
    cout<<"Stud Id"<<'\t'<<"Name"<<'\n';
   }
  void display()
   {
  cout<<studid<<'\t'<<'\t'<<name<<endl;
   };
  };
   int main()
   {
   Mystrud MS;
   MS.reg();
   MS.display();
   return 0;
   }
```
</div>

2.	**Write with example how will you dynamically initialize objects?**

❖ When the initial values are provided during runtime then it is called dynamic initialization.

Example program to illustrate dynamic initialization

```
#include<iostream>
using namespace std;
class X
{
int n;
float avg;
public:
X(int p,float q)
{
n=p;
```

Output :
Enter the Roll Number 1201
Enter the Average 98.6
Roll number :1201
Average :98.6

```
avg=q;
}
void disp()
{
cout<<"\nRoll number:- " <<n;
cout<<"\nAverage :- "<<avg;
}
};
int main()
{
int a ; float b;238
cout<<"\nEnter the Roll Number";
cin>>a;
cout<<"\nEnter the Average";
cin>>b;
X x(a,b); // dynamic initialization
x.disp();
return 0;
}
```

4.	**Given the following C++ code, answer the questions (i) & (ii).**
	Class TestMeOut
	{
	public:
	~TestMeOut() //Function 1
	{cout<<"Leaving the examination hall"<<endl;}
	TestMeOut() //Function 2
	{cout<<"Appearing for examination"<<endl;}
	void MyWork() //Function 3
	{cout<<"Attempting Questions//<<endl;}
	};
	(i) In Object Oriented Programming, what is Function 1 referred as and when does it get invoked / called ?Function 1 is called Destructor.
	(ii) In Object Oriented Programming, what is Function 2 referred as and when does it get invoked / called ?Function 2 is called Constructor.

2.	**Define a class RESORT with the following description in C++ :**
	Private members:
	Rno // Data member to store room number
	Name //Data member to store user name
	Charges //Data member to store per day charge
	Days //Data member to store the number of days
	Compute( )/*A function to calculate total amount as Days * Charges and if the total
	                 amount exceeds 11000 then total amount is 1.02 * Days *Charges */
	Public member:
	GetInfo( ) /* Function to Read the information like name , room no, charges and days*/
	DispInfo( ) /* Function to display all entered details and total amount calculated using
	                 COMPUTE function*/

Answer:	Output:
#include<iostream>	Enter customer name : Kingston
using namespace std;	Enter charges per day : 1500
class RESORT	Enter no of days : 3
{	Enter room no : 101
private:	Customer name : Kingston
int Rno, Days, charges;	Charges per day: 1500
char Rname[20];	Number of days :3
int compute()	Total Amount : 4500
{	
if (Days * Charges > 11000)	
return (Days * Charges * 1.02);	
else	

```
return ( Days * Charges);
}
public:
GetInfo()
{
cout<< "\n Enter customer name :";
cin>>Rname;
cout<< "\n Enter charges per day:";
cin>>Charges;
cout<< "\n Enter Number of days:";
cin>>Days;
cout<< "\n Enter Room Number:";
cin>>Rno;
}
dispinfo()
{
cout<< "\n Room Number:" <<Rno;
cout<< "\n Customer name:" <<Rname;
cout<< "\n Charges per day:" <<Charges;
cout<< "\n Number of days:" <<Days;
cout<< "\n Total Amount:" <<compute();
}
};
Int main()
{
RESORT S;
S.getinfo();
S.dispinfo();
}
```

3.	Write the <u>output</u> of the following.	<u>Output:</u>

```
#include<iostream>
using namespace std;
class student
{
int rno, marks;
public:
student(int r,int m)
{
cout<<"Constructor "<<endl;
rno=r;
marks=m;
}
void printdet()
{
marks=marks+30;
cout<<"Name: Bharathi"<<endl;
cout<<"Roll no : "<<rno<<"\n";
cout<<"Marks : "<<marks<<endl;
}
};
int main()
{
student s(14,70);
s.printdet();
cout<< "Back to Main";
return 0;
}
```

Output:
Constructor
Name: Bharathi
Roll no:14
Marks : 100
Back to Main

	(BOOK BACK QUESTIONS & ANSWERS)
2.	**List the operators that cannot be overloaded.** 1.Scope operator (**::**) **2.**Sizeof **3.**Member selector (**.**) 4.Member pointer selector (*****) 5.Ternary operator (**?:**)

3.	**class add{int x; public: add(int)}; Write an outline definition for the constructor.**
	add (int temp)
	{
	   x = temp;
	}

5.	**Class sale (int cost, discount ;public: sale(sale &); Write a non inline. definition for constructor specified; (3Mark)**
	class sale
	{
	int cost, discount;
	public:
	sale(sal&);
	sale : : (sale &s)
	{
	cost = s.cost;
	discount = s.discount;
	}

2.	**Answer the question (i) to (v) after going through the following class.**
	
	        class Book {
	        int BookCode ; char Bookname[20];float fees;
	        public:
	        Book( ) //Function 1
	        { fees=1000;
	        BookCode=1;
	        strcpy(Bookname,"C++"); }
	        void display(float C) //Function 2
	        { cout<<BookCode<<":"<<Bookname<<":"<<fees<<endl; }
	        ~Book( ) //Function 3
	        { cout<<"End of Book Object"<<endl; }
	        Book (intSC,char S[ ],float F) ; //Function 4
	};
	Answer:
	1) In the above program, what are Function 1 and Function 4 combined together referred as?
	   Constructor overloading
	2) Which concept is illustrated by Function3? Function 3 is destructor.
	   When is this function called/ invoked? Destructor gests executed, when object goes out of scope.
	3) What is the use of Function3? To remove the memory space of the object allocated by the
	   constructor at the time of creating object.
	4) Write the statements in main to invoke function1 and function2
	   Function 1 invoke → **Book()** constructor function automatically when object b Created.
	   Function 2 invoke → **display (float C)** function passing a float value.
	5) Write the definition for Function4
	   Book :: Book(int SC,char S [ ],float F) // function 4
	   {
	    BookCode=SC;
	    strcpy (Bookname, S);
	    fees=F;
	    }

3.	Write the output of the following program.	Output:

```
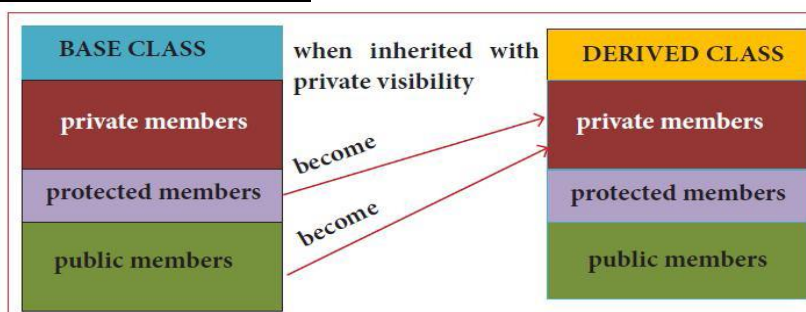include<iostream>
using namespace std;
class Seminar
{
int Time;
public:
Seminar()
{
Time=30;cout<<"Seminar starts now"<<endl;
}
void Lecture()
{
cout<<"Lectures in the seminar on"<<endl;
}
Seminar(int Duration)
{
Time=Duration;cout<<"Welcome to Seminar "<<endl;
}
Seminar(Seminar &D)
{
Time=D.Time;cout<<"Recap of Previous Seminar Content "<<endl;
}
~Seminar()
{
cout<<"Vote of thanks"<<endl;
}
};
int main()
{
Seminar s1,s2(2),s3(s2);
s1.Lecture();
return 0;
}
```

Output:
Seminar starts now
Welcome to Seminar
Recap of Previous Seminar Content
Lectures in the seminar on
Vote of thanks
Vote of thanks
Vote of thanks

4.	Answer the questions based on the following program

```
#include<iostream>
#include<string.h>
using namespace std;
class comp {
public:
char s[10];
void getstring(char str[10])
{ strcpy(s,str); }
void operator==(comp);
};
void comp::operator==(comp ob)
{ if(strcmp(s,ob.s)==0)
cout<<"\nStrings are Equal";
else
cout<<"\nStrings are not Equal"; }
int main()
{ comp ob, ob1;
char string1[10], string2[10];
cout<<"Enter First String:";
cin>>string1;
ob.getstring(string1);
cout<<"\nEnter Second String:";
cin>>string2;
ob1.getstring(string2);
ob==ob1; return 0; }
```

1) **Mention the objects which will have the scope till the end of the program**
   Objects: ob and ob1 of main ()

2) **Name the object which gets destroyed in between the program**
   Object ob in operator ==(comp ob) function gets destroyed in between the program

3) **Name the operator which is over loaded and write the statement that invokes it.**
   Operator overloaded is: = = ;   Invoke the statement is: ob = = ob1

4) **Write out the prototype of the overloaded member function**
   void comp :: operator = = (comp ob)

5) **What types of operands are used for the overloaded operator?**
   User defined data type class objects are used for the overloaded operator.

6) **Which constructor will get executed in the above program?**
   User defined data type class objects are used for the overloaded operator.

7) **Which constructor will get executed in the above program?**
   Constructor is not defined in the class.
   So complier generated default constructor and will executed

Write the output of the program
   Output-1: Enter First String: Computer
              Enter Second String: Computer
              Strings are Equal.
   Output-2: Enter First String: Computer
              Enter Second String: Science
              Strings are not Equal.

	CHAPTER – 16 Inheritance
	(BOOK BACK QUESTIONS & ANSWERS)
2.	**Explain the different visibility mode through pictorial representation:**
	1.Private visibility mode:

2.Protected visibility mode:

3.Public visibility mode:

3.	**Consider the following c++ code and answer the questions**

class Personal   3.1 **Which type of Inheritance is shown in the program?**
{   Multiple Inheritance
int Class,Rno;   3.2 **Specify the visibility mode of base classes.**
char Section;   Private ⟶ Marks class ; Public ⟶ Result class
protected: 3.3 **Give the sequence of Constructor/Destructor Invocation when object of class Result is created.**
char Name[20];   Constructor ⟶ Personal, Marks, and result are executed.
public: Destructor ⟶ Result, Marks, and personal will be executed**.**
personal();   3.4 **Name the base class(/es) and derived class (/es).**
void pentry();   Base Classes ⟶ Personal and Marks   Derived Class ⟶ Marks and Result
void Pdisplay(); }; 3.5 **Give number of bytes to be occupied by the object of the following class:**
class Marks:private Personal   (a) personal : 29 bytes ; (b) Marks : 39 bytes; (c) Result : 97 bytes
{ float M{5};   3.6 **Write the names of data members accessible from the object of class Result.**
protected: M[5]   Grade[5]   Total Agg   FinalGrade   Commence[20]
char Grade[5];   3.7 **Write the names of all member functions accessible from the object of class Result.**
public: Mentry(); Mdisplay(); Rcalculate(); Rdisplay();
Marks();   3.8 **Write the names of all members accessible from member functions of class Result.**

void Mentry();	Data Members	Member Functions
void Mdisplay(); };	M[5]	Mentry();
class Result:public Marks	Grade[5]	Mdisplay();
{	Total Agg	Rcalculate();

	float Total,Agg; FinalGrade Rdisplay();
	public: Commence[20]
	char FinalGrade, Commence[20];
	Result();
	void Rcalculate();
	void Rdisplay();
	};

4.	**Write the <u>output</u> of the following program**

```
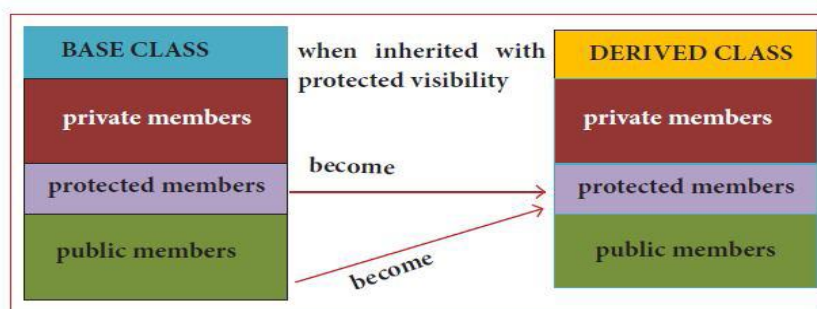#include<iostream>
using namespace std;
class A
{ protected:
int x;
public:
void show()
{cout<<"x = "<<x<<endl;}
A()
{ cout<<endl<<" I am class A "<<endl;}
~A()
{ cout<<endl<<" Bye ";} };
class B : public A
{protected:
int y;
public:
B(int x1, int y1)
{ x = x1;
y = y1; }
B()
{ cout<<endl<<" I am class B "<<endl; }
~B()
{ cout<<endl<<" Bye "; }
void show()
{ cout<<"x = "<<x<<endl;
cout<<"y = "<<y<<endl; } };
int main()
{A objA;
B objB(30, 20);
objB.show();
return 0; }
```

Output:
```
I am class A
I am class A
x=30;
y=20;
Bye
Bye
Bye
```

5.	**Debug the following program.**	**Correct Code:**
	1. %include(iostream.h)	1.#include<iostream>
	2. #include<conio.h>	2.#include<conio.h>
	3. Class A()	3.using namespace std;
	4. {	4.class A
	5. public;	5.{
	6. int a1,a2:a3;	6.public:
	7. void getdata[ ]	7.int a1,a2,a3;
	8. {	8.void getdata()
	9. a1=15;	9.{
	10. a2=13; a3=13;	10. a1=15; a2=13; a3=13;
	11. }	11.}
	12. }	12.};
	13. class B:: public A()	13.class B:public A
	14. {	14.{
	15. PUBLIC	15.public:
	16. voidfunc()	
	17. {	
	18. int b1:b2:b3;	
	19. A::getdata[];	
	20. b1=a1;	

```
21. b2=a2;
22. a3=a3;
23. cout<<b1<<'\t'<<b2<<'t\'<<b3;
24. }
25. void main()
26. {
27. B der;
28. der1:func();
29. }
```

L.n	Given code	Correct Code
1.	%include(iostream.h)	#include<iostream.h>
3.	Class A( )	Class A
5.	public;	public:
6.	int a1,a2:a3;	int a1,a2,a3;
7.	Void getdata[ ]	void getdata( )
10.	a2=13; a3=13;	a2=14; a3=13; (In order to get the given output)
12.	}	};
13.	Class B:: public A()	class B:: public A
15.	PUBLIC	public:
16.	voidfunc()	void func()
18.	int b1:b2:b3;	int b1,b2,b3;
19.	A::getdata[];	A::getdata( );
22.	a3=a3;	b3=a3;
23.	cout<<b1<<'\t'<<b2<<'t\'<<b3;	cout<<b1<<'\n'<<b2<<'\n'<<b3;
24	}	};
28	der1:func();	der:func();