Index

Sadguru's Education Centre

V.J.T.I. - Computer Programming Question Set – January 2015

Chapter 1. Fundamentals of C++ Language

1. Explain the different numeric data types and the different qualifiers and the size of the memory associated with them.

2. What is the data range for different data types?

3. Determine which of the following numerical values are valid constants. If a constant is valid, specify whether it is integer or real. Also, specify the base for each valid integer constant.

(a) 0.5	(b) 27,822	(c) 9.3e12
(d) 9.3e-12	(e) 12345678	(f) 0.8e + 0.8
(g) 0.8e8	(h) 0515	(i) 018CDF

4. What are character constants? What are backslash characters? Why are they used?

5. What are string constants?

6. State whether valid or not valid string constants:

1) '8:15 P.M.'
2) "Name:"
3) "Amachi Mumbai"

7. What is an identifier? Explain the rules governing naming of identifier.

8. Determine which of the following are valid identifiers? If invalid, explain why?

(a) record 1 (b) 1 record (c) file_3 (d) return (e) $ tax

(f) name (g) name and address (h) name_and_address

(i) name-and-address (j) 123-45-6789

9. List all the C++ keywords.

10. What is a variable?

11. What is the purpose of a type declaration? What are the components of a type declaration?

12. How are initial values assigned to variables within a type declaration? How are strings assigned to one dimensional, character-type arrays?

13. Write appropriate declaration and assign the given initial values for each group of variables:

(a) Floating-point variables : a = -8.2, b = 0.005
Integer variables : x = 129, y = 87, z = -22
Character variables : c_1 = 'w', c_2 = '&'

(b) Double precision variables: $d_1 = 2.88 \times 10^{-8}$, $d_2 = -8.4 \times 10^{5}$

(c) Long integer variable : big = 123456789
Double precision variable : c = 0.3333333333

(d) Character variable : eoln = newline character

14. What is a *const* declaration in C++?

15. Point out errors if any in the following program:

```
int main( )
{       const double pi;
        int n ;
        pi = 3.1459265358979;
        n = 22;
        .....
        return 0;
}
```

16. Differentiate between two following statements: 2M11

```
#define PI 3.24
const float PI = 3.14;
```

17. What is an expression? What are its components?

18. Describe the arithmetic operators available in C++. Summarize the rules associated with their use.

19. Explain division and modulus operator. 2M13

20. Suppose *a*, *b*, *c* are integer variables that have been assigned the values
$a = 8, b = 4, c = -5$
Determine the value of each following expression.

(i) a % b	(ii) a / c	(iii) a * b / c	(iv) a * (c % b)
(v) 2*b + 3*(a-c)	(vi) (a * c) % b	(vii) a + b – c	(viii) a % c

21. Describe the relational operators included in C++. With what type of operands can they be used? What type of expression is obtained?

22. Enlist relational operators with their meaning. 2E09

23. Describe the equality operators included in C++. How do they differ from the relational operators?

24. Describe the logical operators included in C++. What is the purpose of each? With what type of operands can they be used? What type of expression is obtained?

25. What are unary operators? How many operands are associated with an unary operator? Describe all the unary operators used in C++.

2M13

26. What is type casting? Explain with examples.

27. What is the relative precedence of relational, equality and logical operators with respect to one another and with respect to the arithmetic and unary operators? What is their associativity?

28. A C program contains the following declarations and the initial assignments are -

```
int i = 8, j = 5 ;
float x = 0.005, y = - 0.01 ;
char c = 'c' , d = 'd' ;
```

Determine the value of each following expression. Use the values initially assigned to the variables.

(i) (3 * i - 2 * j) % (2 * d - c)

(ii) 2 * (i / 5) + (4 * (j - 3) % (i + j - 2))

(iii) ++i

(iv) i++

(v) c == 99

(vi) !(c == 99)

(vii) (x > y) && (i > 0) | | (j < 5)

(viii) (x > y) && (i > 0) && (j < 5)

2M11

29. Describe the six assignment operators. What is the purpose of each?

30. Explain with example: Shorthand assignment operator. 2E09

31. Explain the difference between pre-increment and post-increment operator with examples. 4E13

32. Explain the difference between i++ and ++i with an example. 2M12

2M13

33. How will you differentiate increment/decrement operators in prefix and postfix notations? How it can be used for the expression y = x = x -1; 2M10

34. For each of the statement below assume that $x = 100$ and $y = 100$ before the execution of the statement. In each case, what are the values of x and y after execution?

i) x = - - y * 4;
ii) x = y = y++;
iii) x = y = = 100;
iv) x = y = = y++;
v) x = = y = y++;

2E09

35. What is the value of a after evaluating the following expression if a is float? **1M11**
(a++/b==2||--a>=10&&--a<-b)

(a) 11 (b) 10 (c) 9 (d) None of these.

36. What is the value of *z* in the following expressions if *z* is declared as an *int* variable:

i) z = 7 / 22 * (3.14 + 2) * 3 % (-5)
ii) z = 30 * 1000 + 2768

1M12

37. Which of the following is a valid syntax?

a. float a = float b; b. float a = c;
c. a = float b; d. float char a;

1M10

38. What is the value of following expression:
10!=15&&!(10<20)||15>30

Select the correct answer:

39. What is the data type of the value after evaluation of following expression assuming *a* as *int* and *x* as *float*: **1M10**

x = (a++ >= || --x!=0)

(a) int (b) float (c) boolean (0 or 1) (d) invalid expression

40. What is the value of *a* after evaluating the following expression if *a* and *b* are *int* and values are 2 and 3 respectively before evaluating the expression **1M11**

(a++ / b==0 || --a >= 10)

(a) 3 (b) 2 (c) 1 (d) None of these.

41. The operators in following are listed as per priorities. Which alternative of them is correct? **1M11**

(a) !, ==, >=, &&, = (b) %, +, ||, &&, %=
(c) (a) and (b) both are correct (d) None of these.

42. The operators are listed as per their priorities. Which of the following alternative is correct? **1M11**

(a) ++, %, >=, ||, += (b) %, +, !=, &&, %=
(c) (a) and (b) are both correct (d) None of the above

43. List the classification of 'C operators' and explain any four with an example. **4M10**

44. Explain bitwise operators in C. **5E11**

45. Explain bitwise shift operators << and >> giving one example each. **4E10**

46. Explain bitwise operators & and | giving one example each. **4E10**

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Chapter 2. Simple Programs

1. Which are the input and output operators used in C++?

2. How does comment style of C++ differs from C? What is the advantage of the new comment style?

3. Select the correct answer: **1M11**
Output of the following statement if $a = 2$ and $b = 3$:

```
cout << (a<<2) << '\t' << (b>>3);
```

(a) 2 3 (b) 1 8 (c) 8 1 (d) Invalid expression

4. What is the output of the following statement if $z = 15$; **1M12**

```
cout << (z << 2) <<'\t' << (z >> 2);
```

a. 2 15 b. 3 60
c. 60 3 d. invalid expression

5. What is the output of the following program : **2E10**

```
void main()
{
clrscr();
int i = 5;
int a = ++i + ++i + ++i;
cout << a;
getch();
}
```

6. What is the output of the following program :

```
#include<iostream.h>
int main()
    {int a = 5, b = 2, c = 3;
    float x = 2.5, y = 0.2;
    cout<<endl<<a%b + b/c -  x/a;
    cout<<endl<<a% b++ / (c-x) /a;
    cout<<endl<<2500*a*double(c);    //casting
    y = a/b + c*y/b++;
    x = a++/c - b;
    cout<<endl<<x++<<'\t'<<++y;
    a %= --b; b *= x; c =-b+y;
    cout<<endl<<a<<'\t'<<b<<'\t'<<c;
    return 0;
    }
```

7. Write a C++ program to convert the temperature given by the user in degree Fahrenheit to degree Centigrade by using the formula

$$C = \frac{5}{9}(F - 32)$$

2M12

8. Explain dynamic initialisation of variables.

9. Write a C++ program, which will read radius of a circle and shall output the area and circumference of the same.

10. Write a program that accepts length and breadth of a rectangle and finds its area. It also determines what would be the radius of a circle if the same area were to be occupied by a circle.

11. Write a C++ program to accept three sides of a triangle as integers and calculate perimeter and area.

12. Two sides of a triangle are a and b. The angle included by these sides is θ. Write a C++ program to find the length of third side c and area of the triangle. 4M10

$$c = \sqrt{a^2 + b^2 - 2ab\cos\theta} \quad \text{and} \quad area = \frac{ab\sin\theta}{2}$$

13. Write a C++ program, which will read the initial deposit, period and the rate of interest and find and print the final amounts with simple interest and compound interest. Also print difference between the two.

14. Write a C++ program to solve the quadratic equation $ax^2 + bx + c = 0$. Assume that the input will be such that the roots will always be real.

15. Write a C++ program which will solve simultaneous equations 4M10

$$a_1x + b_1y = c_1 \text{ and } a_2x + b_2y = c_2$$

H.W 16. Write a program to reverse a two digit number. 5M13

H.W. 17. WAP to find digits at hundred's, ten's and unit's place for a 3 digit number. 4M12

H.W. 18. WAP which reads the co-ordinates of the vertices of a triangle and outputs perimeter and the area of the triangle. 4M12

19. Write a program to interchange the values of two variables.

20. Write a program to interchange the values of two variables without using the temporary variable.

Answer the following by choosing the correct alternative.

21. Output of the following statement is ____ 1M11

```
cout << "C:\tc\bin";
```

(a) C:\tc\bin (b) C: (c) \tc\bin (d) None of these

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Chapter 3. Conditional Statements

1. What is the syntax of *if* statement in C++ language? When is it used in programming?

2. Write a C++ program, which will read two unequal integer numbers and shall print out the larger of the two at the output.

3. What is the syntax of *if–else* statement in C++ language? When is it used in programming?

4. Write a C++ program, which will read two unequal integer numbers and shall print out both the numbers at the output in descending order.

5. Write a C++ program, which will read three unequal numbers and shall output the largest of the three.

6. How are nested if-else statements interpreted? In particular how is the following interpreted?

   if *(e1) if (e2) s1 else s2*

   Which logical expression is associated with the else clause?

7. What is the output of following program: **1M11**

```
#include <iostream.h>
void main()
{long a = 10, b = 4/5;
 if(a && b==0)cout << "People call me fool";
 else if(b%a==0)cout <<"CP is not my cup of tea";
 else cout <<"I quit engineering";
}
```

   (a) People call me fool (b) CP is not my cup of tea
   (c) I quit engineering (d) None of these.

8. Write a C++ program, which will read three unequal integers and shall output all the three integers in decreasing order.

9. Write a C++ program which reads three sides of triangle and shall print out whether triangle is right angled triangle or not.

10. Input three positive integers representing three sides of a triangle and confirm whether they form a valid triangle. (Hint: In a triangle sum of any two sides should be greater than the third side.) **4M10**

11. Write a C++ program to input three sides of a triangle and classify it as equilateral, isosceles or scalene. Also calculate the area of the triangle. **4M11**

12. Write a program to determine whether the seller has made profit or incurred loss. Also determine how much profit he made or loss he incurred. Cost price and selling price of an item is input by the user. **5M13**

13. WAP to output roots of a quadratic equation. Roots may be real or imaginary. **4M11**

14. Develop a program to accept a year as input and printout if it is a leap year or not. A year is a leap year if it is divisible by 4 and centennial years (years divisible by 100) are leap years only when they are also divisible by 400. **10M13**

15. Write a program to calculate monthly telephone bill as per following rules:

    a) Minimum 200 Rs for up to 100 calls
    b) 60 paisa per call for next 50 calls.
    c) 50 paisa per call for next 50 calls.
    d) 40 paisa beyond 200 calls.

16. Enter the marks of five subjects of first year students of VJTI. Calculate the percentage and declare the result. Assume the following data: **10M13**

    a) If the percentage is greater than or equal to 75, then Distinction.
    b) If the percentage is greater than or equal to 60 and less than 75, then First Class.
    c) If the percentage is greater than or equal to 40 and less than 60, then Second Class.
    d) Less than 40, then Fail.

17. Explain conditional operator with one example. **2M10**

18. Explain the ternary operator provided by C++. **2M13**

19. Explain with example: Ternary operator **2E09**

20. What is the output of following code: **1M12**

```
int a = 3, b = 7, c = 1, result;
result = (a<b?a:b) < c ? (a<b?a:b) : c;
cout << result;
```

    a. 3 b. 1 c. 7 d. 0

21. Write a program to input month number and output number of days in that month. **4M10**

22. Explain *switch-case* statement with example. **5E10**

23. Explain *switch* statement as a difference from nested *if else*. **4E10**

24. Explain the suitability of *switch* statement over *if-else* statement. **2M11**

25. In *switch-case*, what is the use of *default* label? **2.5E13**

26. What's the importance of *break* statement in *switch-case* control structure?

27. Determine the output of the following program.

```
void main()
{
  int i=50;
  switch ( i )
  { case 49: printf ("49");
    case 50 : printf ("50");
    case 51 : printf ("51");
   }
}
```

28. State true or false giving reason, Credit will be given only with correct reason. False **1E12**
The value that follows the keyword case in switch-case statement, may be integers, characters, floating point numbers or character strings.

29. Write a menu driven C++ program of a simple calculator using switch-case construct. **10M13**
Simple calculator must consist of the following operations:

1) Addition (+)
2) Subtraction (-)
3) Multiplication (*)
4) Division (/)
5) Modulus (%)

****

Chapter 4. Looping Structures

1. What is the purpose of *while* statement? When is the logical expression evaluated?

2. Analyze each of the program segments that follow and determine how many times the body of each loop will be executed.

(i)

```
x = 7;
y = 77;
while (x < = y)
{  x = y/x ;
   .....
   .....
}
```

(ii)

```
int m = 24;
int n = 7 ;
while (m % n >  = 0)
{   .....
    .....
    m = m + 1 ;
    n = n + 2 ;
    .....
}
```

3. What is the purpose of the *do-while* statement? How does it differ from the *while* statement. What is the minimum number of times *do-while* loop can be executed? Compare with a *while* loop and explain the reasons for the difference.

4. Analyze the program segments and determine how many times the body of the loop will be executed.

```
m =1;
do
{
.....
.....
m = m + 2;
}
while (m < 10);
```

5. Explain the difference between *do-while* and *while* loop. **4E13**

6. What is the purpose of *for* statement? How does it differ from the *while* statement and the *do while* statement? How many times a *for* loop is executed? Can any of the three initial expressions in for statement be omitted? If so, what are the consequences of each omission?

7. What is the purpose of the comma operator? Within which control statement does the comma operator usually appear?

8. Explain which loop is suitable for what type of problem with examples

(i) for loop (ii) while loop (iii) do while loop

What is the output of the following:

9. **2E09**

```
void main()
{
int i, j;
i=j=2,3;
clrscr();
while(--i&&j++)
      cout << i << j;
getch();
}
```

10. **3M10**

```
#include <stdio.h>

void main()
{
int a = 5, b = 13, c; float x;
x = b/a * 2.5;
c = ++a + b % a * 10;
printf("C = %d X = %%f", c, x);
for(x = 1; x >=5; x++)
   printf("I am Mad");
}
```

Select the correct alternative:

11. **1M11**

```
for(x = 1; x >= 5; x++)
   printf("*");
```

(a) * (b) ***** (c) No output (d) Error

12. The following statement will execute ____ times. **1M12**

```
for(k = 1; k < 100; k++) {k--;}
```

a. 101 b. 100 c. infinite d. 99

13. When block is to be executed at least once do while loop is used. Comment on this giving one example. (Do not write program.) **2M11**

14. What is the output of following program? Convert *while* loop into *do while* loop for same output and rewrite the program. **4E10**

```
#include<iostream.h>

void main()
{
int x = 10, y = 10;
while(x>0)
      cout << (x-=3) <<'\t';
 y+=x;
 cout<<x<<'\t'<<y;
}
```

15. What is the output of the following program? Convert do-while loop into while loop for same output and rewrite the program. **5M12**

```
void main()
{
 int x=10, y=10;
 do
   {cout << (x -=3) <<'\t';
    y+=x;
   while(x>0);
   cout << y;
  }
}
```

16. State whether following statement is True or False: **1M10**
In a pretest loop, if the body is executed n times, the test expression is executed $n+1$ times.

17. In do-while, the loop gets executed at least once. **1E12**

18. Describe and compare entry-controlled and exit-controlled loop. **5E10**

19. Write a program for summation of all the natural numbers up to and including the given integer.

20. Write a program to evaluate sum of the following series: **4M10**

$$\text{Sum} = 1 + 2^2 + 3^2 + 4^2 + \ldots\ldots + n^2$$

21. Write a program to do summation of odd numbers in the range of 50 and 100. **2M10**

22. Write a program to calculate a factorial of a number.

23. Write a program to output ASCII values of alphabets both capital and small case. **4M10**

24. Write a program to read marks of 100 students and find and print the number of students passed in first class. The marks are out of 100 and to get first class one has to obtain minimum 60 marks.

25. Suppose Rs 5,000/- is deposited each year in an account which yields 10% interest compounded annually. Write a program, which prints the amount in the account at the end of each year for 10 years.

26. Write a program to compute the distance S fallen by an object in free fall. The formula is **4M11**

$$S = S_0 + V_0 t + 1/2at^2$$

Make a table of S for t = 1, 5, 10, 15, 20, 25 . . . . 100.

27. Write a program to input a series of numbers, and the program should end when the sum of numbers entered so far is divisible by 5. The program should output the final sum and the count of how many values are read.

28. Write a program that reads numbers until a negative number is read, and prints

    i. number of values read,
    ii. the largest value and
    iii. the smallest value.

29. Write a program to input a number and output whether it is prime or not. **4M10 5M13**

30. Write a C++ program to generate the first *n* prime numbers.

31. Write a C++ program to generate the first fifty prime numbers and print their sum and average.

32. Write a C program to display and count prime numbers between 100 and 200. **5E10**

33. If a number is not divisible by the range 2 to square root of that number then it is prime. Using this rule WAP to print first *n* prime numbers. **4M11**

34. Write a program that asks the user for an integer and then prints out all its prime factors. For example, when user inputs 150, the program should print
    2 3 5 5

35. Write a program to find GCD and LCM of two numbers entered by the user. **5M11**

36. Write a C++ program to generate Fibonacci series

    (1, 1, 2, 3, 5….) for *n* number of terms.

37. Write a program that prompts the user for *n* and prints the n^{th} value of Fibonacci sequence.

38. Write a program, which will read an integer *n* and which will check whether that number is a Fibonacci number or not.

39. Write a program, which will find and print sum of first 100 odd numbers.

40. Write a program to compute the value of following series up to n terms –

$$1+\frac{1}{1!}+\frac{1}{2!}+\frac{1}{3!}+\ldots\ldots$$

41. Write a program to compute the value of sine of x using the Taylor's series –

$$\sin(x)=x-\frac{x^3}{3!}+\frac{x^5}{5!}-\frac{x^7}{7!}+\ldots\ldots$$

where x is in radians. The sum is performed until the term to be added / subtracted becomes less than 10^{-6} or up to 20 terms. The value thus obtained should be compared with the standard library function *sin(x)* and the error should be printed.

42. Write a program to evaluate following function to 10^{-3} accuracy. **4M11**

$$SUM = \frac{a+x}{1!} + \frac{a+x^2}{2!} + \frac{a+x^3}{3!} + \frac{a+x^4}{4!} + ...$$

43. Give reason in short: **1M10**
When break statement is used in a loop it is always conditional.

44. Write a program to simulate a calculator which serves following options :- **10E05**

1. Add 2: Subtract 3: Multiply 4: Divide 5: Quit.

The program should recur until user selects option 5 to quit. Also make the arrangement to prompt for 'Division By Zero' error manually in case of 'divide' operation.

45. Write a program to calculate the sum of digits of an integer value input by the user assuming the value will be within the *int* range.
(e. g : Number = 12345 Sum = 15)

46. Write a C program using *while* loop to reverse the digits of a number without using array. **5E10**

47. Write a program to check if the given number is an 'Armstrong number'. An Armstrong number of 3 digits is an integer such that the sum of the cube of its digits is the number itself. **4M12**

48. Write a program which finds all four digit perfect squares where the number represented by the first two digits and the number represented by the last two digits are also perfect squares. e.g. $1681 = 41^2$. $16 = 4^2$, $81 = 9^2$ **4M11**

49. What rules apply to nested loops? Can one type loop be embedded within another?

50. How many *s will appear in the output of the following part of the program: **1M10**

```
int i, j;
for(i = 0; i < 5; i++);
    for(j = 0; j < 10; j++)
        printf("*");
for(j = -2; j <=20; j++)   printf("*");
```

(a) 55 (b) 50 (c) 14 (d) There is error

51. Write a program, which will read an integer and shall print out multiplication table of that integer.

52. Write a program, which will read an integer and shall print out all the multiplication tables up to and including that integer.

53. Write a program to get the following output.

```
1
12
123
1234
12345
```

54. Write a program to print the following output using *for* loops.

```
1
2   2
3   3   3
4   4   4   4
5   5   5   5   5
```

55. Write a program which will read positive integer number *n* and shall print out all the integers up to and including *n* in this form.

```
1
2  3
4  5  6
7  8  9  10
```

56. State *true* or *false* giving reason. Credit will be given only with correct reason. **1E10**
When break statement is used in nested loops, control comes out of both the loops.

57. What is the purpose of *goto* statement? Give the syntax. **2E09**

58. Write a program to output following number pyramid: **4M10**

```
9   7   5   3   1
    7   5   3   1
        5   3   1
            3   1
                1
```

59. WAP to print the pattern: **5M12**

```
A B C D C B A
  A B C B A
    A B A
      A
```

60. Write a program to display following pattern: **5E09**

```
        A
    A   B   A
A   B   C   B   A
```

61. WAP to output following number pyramid using single for loop for output of one line: **6E10**

```
3   2   1   0   1   2   3
    2   1   0   1   2
        1   0   1
            0
```

62. WAP to output following number pyramid using single *for* loop for output of one line: **6E10**

```
      0
    1   1
  2   0   2
3   1   1   3
```

63. WAP to output following number pattern: **4M11**

```
        0
      1 0 1
    2 1 0 1 2
  3 2 1 0 1 2 3
4 3 2 1 0 1 2 3 4
```

64. What is the purpose of the *break* statement? Within which control statements can the break statement be included? What is the purpose of *continue* statement? Within which control statement can a *continue* statement be included? Compare with the *break* statement. Explain the difference between *break* statement and a *continue* statement with examples.

65. Write the syntax and brief description for following: **4M10**

a. *if-else* statement
b. Nesting of *if-else* statement
c. *switch* statement
d. *while* statement
e. *do while* statement
f. *for* statement

Select the correct alternative:

66. Which of the following is invalid statement: **1M11**

(a) if(100); (b) for(;;)
(c) do; while(0); (d) All above are invalid.

67. What is the output of the following code: **1M11**

```
for(i = 5; i > 0; i-=3)
   if(i%3==0)break;
   cout <<< '\t' << i;
```

(a) -1 (b) 5 2 (c) 0 (d) Loop will not terminate

6E10

2E10

68.
```
void main()
{int x = 011, i;
clrscr();
for(int i = 0; i < x;  i+=3)
    {cout << "Start";
     continue;
     cout << "End";
    }
getch();
}
```

****

6E10

4M11

4M10

M11

M11

Chapter 5. Functions

1. What is meant by standard functions? What is an argument?
2. Name some standard functions available in C++. State the purpose of each.
3. What is the return type of standard function abs() from the following **1M10**

   (a) int (b) double (c) float (d) void
4. What is meant by user defined functions? Why are they required? How are they defined? How are they referenced? How do these functions communicate with the main program?
5. Summarize the rules governing the use of the *return* statement. Can multiple expressions be included in a *return* statement? Can multiple *return* statements be included in a function?
6. Explain the difference between a function declaration and a function definition. When is a function declaration required?
7. Differentiate between formal and actual parameters
8. Determine *true* or *false*: **1E10**
   A function without return statement is illegal.
9. Fill in the blanks: **1E10**
   When there are several return statements within function body, function terminates at _____ return statement.
10. Give reason in short: **1M10**
    Returning functions cannot return more than one value.
11. When it is suitable to use a user function? Explain call statement in short. **2M10**
12. What is a preprocessor directive? **2.5E13**
13. What is the purpose of header files? **2E09**
14. Write a program using function *max* which will accept two float values and shall return the maximum of the two and use it in the main program to find out maximum of four values.
15. Write a function to return the value of

$$f(x) = x^2 - 2x + 10$$

The calling expression from the main is

$$\frac{f(a)+f(b)}{f(a)-f(b)}$$

16. Write a function to find factorial of a number. Write a program to find the coefficients of binomial expansion given by

$$^nC_r = \frac{n!}{r!*(n-r)!}$$

17. Write a function *reverse_me* which accepts an integer as parameter and returns the number with digits reversed.
e.g. reverse_me(1234) should return a value of 4321,
reverse_me(-1234) should return a value of –4321.

18. Write a function to check whether the entered number is a palindrome or not.
example - 1234321, 1368631 etc.

19. Write a function to check whether a number is a prime number. Write one more function to check whether a number is a Fibonacci number. Use these functions to write a program that reads a positive integer value and determines whether it is a prime number or a Fibonacci number or both or none. The program should execute repeatedly until a zero or negative value is encountered as input.

20. If number is not divisible by the range 2 to square root of that number then it is prime. Using this rule, write a function to check whether the number is prime or not. Using this function write a program to print first *n* prime numbers. **5M11**

21. Write a function to check whether a given number is prime or not. Using this function output first 10 prime numbers. **6E10**

22. Write function by name *sumfun()* with argument x and n which returns the sum of the following series **4E09**

$$x + x^3/3 + x^5/5 + x^7/7 + \ldots\ldots$$

23. What is Recursion? Write a recursive function *fact* to calculate factorial of a given number.

24. Distinguish between recursion and iteration.

25. Write a recursive function to get the n^{th} Fibonacci number. Use this function to generate Fibonacci Series of first *n* numbers.
(Note:- Fibonacci Series 1, 1, 2;, 3, 5, 8, ...)

26. WAP to output first 25 Fibonacci numbers using recursive function. **6E10**

27. Write a recursive function to find sum of odd numbers upto *n*, where *n* should be odd. **2M11**

28. Why in recursive function call to same function is conditional? Write a function to find g c d of two numbers using following Euclid's recursive algorithm: **4M11**

$$g\,c\,d\,(m, n) = \begin{cases} g\,c\,d\,(n, m) & \text{if } n > m \\ m & \text{if } n = 0 \\ g\,c\,d\,(n, m\%n) & \text{otherwise} \end{cases}$$

29. WAP using recursive function for finding the value of y where $y = x^n$. x and y are real numbers and n is an integer number. **4M12**

30. Write a recursive function to find the sum of the digits.

31. Write a program to output binary equivalent of a decimal integer using recursive function. **4M11**

32. WAP to find binary equivalent of a number using recursion function. **5M13 4E13 1M10**

33. State whether following statement is True or False.
In C, all functions except main() can be called recursively.

34. Explain reference variable. **2M13**

35. Describe the output of the following program.

```
int main()
    {       int n = 33;
            int& r=n;
            cout<<"n="<<n<<",r="<<r<<endl;
            --n;
            cout<<"n="<<n<<",r="<<r<<endl;
            r *= 2;
            cout<<"n="<<n<<",r="<<r<<endl;
            return 0;
    }
```

36. What is the concept of passing arguments to function by value and by reference? Can a function also return by reference? Explain with help of an example.

37. What is the difference between call by value and call by reference? **2M13**

38. Write a program to swap values of two variables using function. **5M13**

39. Explain the following with help C++ program for each: **5E13**

    a. Pass by value b. Pass by reference

40. Write a function called *smallzero()* that is passed two integer arguments by reference and then sets the smaller of the two numbers to 0. Write a *main()* program to exercise this function.

41. What is the output of the following program: **3M11**
(Answer must be supported by justification):

```
#include <iostream.h>

int x = 10;
float& ex(int a, float& b)
{
cout << "\nA = " << ++a << "\tB = " << ++b <<"\tX = "<< x++;
return b;
}

void main()
{
float m = 5.5, n = 2.5;
x = ex(m, n);
cout << "\nM = " << m << "\tN = " << n <<"\tX = " << x;
getch();
}
```

42. Fill in the blanks: **1E11**
When argument is sent by reference, the corresponding parameter in the call statement always is a _____.

43. What is sending argument by reference in C++? Explain with programming examples. **4E12**

44. What is the meaning of *const* argument? Can a parameter be a *const* reference? How is it interpreted?

45. Describe the output of the following program.

```
#include<iostream.h>
void f(int x, int& y, const int&z)
        {       x += z; y +=z;
                cout << "x = " << x << ", y = "<< y  <<", z = "<< z <<endl;
        }

int main()
        {       int a = 22, b = 33, c = 44;
                cout << "a = "<< a << ", b = " << b << ", c = " << c << endl;
                f(a,b,c);
                cout << "a = "<< a << ", b = " << b << ", c = " << c << endl;
                return 0;
        }
```

State *true* or *false* giving reason. Credit will be given only with correct reason.

46. When argument is sent by reference, call statement always contains a variable. **1E10**

47. Function cannot return reference of a local variable. Give reason. **2M11**

48. Explain returning by reference using local variable, giving programming example. **4E11**

49. Explain the concept of default arguments with programming examples. **5E11**

50. Write a function *power()* to raise a number *m* to a power *n*. The function takes a *double* value for *m* and *int* value for *n* and returns the result correctly. Use a default value of 2 for *n* to make the function to calculate squares when this argument is omitted. Write *main()* that gets the values of *m* and *n* from the user to test the function.

51. Fill in the blanks: **1E10**
Default arguments are always _____ arguments.

52. What are inline functions? **2E09**

53. Write a program that uses *inline* function for converting pounds to kilogram.
1 pound = 0.453592 kg

54. Write an *inline* function to round the gross salary in rupees and paise to nearest rupee.

55. Can inline functions be used for longer codes? Justify your answer. **2M12**

56. Create an equivalent of four function calculator. The program should request the user to enter a number, an operator and another number. It should carry out the specified arithmetic operation: adding, subtracting, multiplying or dividing the two numbers. Finally display the result. When it finishes calculation, the program should ask if the user wants to do another calculation. (Use switch statement and functions) **5M12**

57. What do you mean by overloading a function? When do we use this concept?

58. Explain function overloading with programming example. **6E11**

59. Write a C++ program to find area of circle and of triangle using function overloading. **5E12 5E13**

60. WAP to find the volume of cube, cylinder and rectangular box using concept of function overloading. **5M12**

61. Write a program to overload a function *square_root()* in three ways so that it returns the square root of an *int*, *long int* and *double*. **6E12**

62. Write a C++ program to solve the following problems using the concept of function overloading **10M13**

- To add two complex numbers and return a complex number.
- To add two pointer variables.
- To add the elements of an integer array.
- To add two character strings.

63. The main function can be overloaded (True / false) Justify. **2M12**

64. Overloaded functions cannot be differentiated by return type. Give reason. **2M11**

65. The two declarations are *int area(float);* and *void area(float);* Can this functions be in same program? Give reason. **2E11**

66. What are the different storage classes? **5E09**

67. What are the different storage classes? Explain with examples. **5E10**

68. How is an automatic variable defined? How is it initialized? What happens if an automatic variable is not explicitly initialized within a function?

69. Differentiate between static and automatic variables. **2M11**

70. Fill in the blanks: **1E10**
_____ variable is created when function is executed for the first time and remains in memory until program terminates.

71. What is the output of the following: **2M10**

```
#include <stdio.h>
int x = 10, y = 20;
void main()
{swap(x, y);
printf("X = %d Y = %d", x, y);
}
```

```
void swap(int x, int y)
{
x = x + y;
y = x – y;
x = x – y;
}
```

72. State whether following statement is *True* or *False*. **1M10**
A global variable may have several declarations but one definition.

73.
```
int x = 5;
int main()
{int x = 1;
cout<< "x = " << x;
return 0 ;
}
```

What is the output of above code? What changes should be made to the code to get the output as: x = 5

74. Explain the use of unary scope resolution operator.

What would be the output of the following programs

75. **1M10**
```
int x = 40;
main()
{int x = 20;
printf("%d", x);
getch();
}
```

76. What will be the value of *a*, after the end of function *func*? 1M12

```
main() {int a = 10; func(a);}
func(int a) {a++;}
```

a. undefined b. 10 c. 11 d. 9

77. Point out the error: 1M10

```
#include <stdio.h>
#include <conio.h>
main()
{int a = f();
void f();
a = f();
printf("\n %d", a);
getch();
}
void f()
{printf("\nHi");
}
```

78. When there is a local variable and global variable within a program with same name, _____ variable gets preference within the function. 1E11

79. What is the lifetime of a static local variable? When it is suitable to use? 2M10 2M11

80. What are storage classes? Give one programming example to demonstrate the same. 10E11

81. What is the order that the local variable is destructed? 2.5E13

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Chapter 6. Arrays

1. What is meant by an array? When is the concept of array required in programming? Can the data of different types be included in one array? How is an array defined in C++? How does one refer to a particular subscripted variable? Can a formula be used as a subscript? Can a reference to standard function be used for this purpose?

2. How are initial values written in a one-dimensional array definition? Must the entire array be initialized? What value is automatically assigned to those array elements not explicitly initialized?

3. Indicate what values are assigned to the individual array elements –
int z[12] = {0, 0, 8, 0, 0, 6};

4. If A and B are two float arrays, then the statement to copy all elements of A into B would be _____ **1E11**

5. Write a program which accepts *n* non-negative integer values (*n* will be given by user) and prints the maximum value out of them.

6. Write a program which will find and print largest and smallest of given *n* integers.

7. WAP to find the largest and the second largest elements in the list entered by the user.

8. Write a program to read *n* integer values and print them all both in ascending and descending order.

9. Write a program which will find out from *n* positive integers, largest even integer or if there is no even integer a message to that effect is printed.

10. Write a program to read 100 values of an integer array and print all of them, ten values on a line.

11. Write a C++ program to sort the elements of array in ascending order using Bubble Sort. **4E13**

12. Find the mean and the median of given *n* positive integers.
Definition: median is middlemost number when the numbers are arranged in ascending or descending order.

13. Write a function for sorting an integer array *x* having *n* elements and print the sorted array. Write main function which will

    (i) Read an integer array *a* having *m* elements.
    (ii) Using the above function *sort()*, sort the array and print it.
    (iii) The main shall then print original unsorted array *a*.

14. Write a C++ program to sort an array in ascending order using Bubble Sort method. (Use function) **10M12**

15. Write a program for computing mean, variance and standard deviation of a set of numbers using the following formula

$$\text{Mean} = 1/n \sum_{i=1}^{n} X_i \qquad \text{Variance} = 1/n \sum_{i=1}^{n} (X_i - Mean)^2$$

$$\text{Standard Deviation} = \sqrt{Variance}$$

16. Write a function to sequentially search an integer *no* from an array *a* having *n* elements.

17. Write a function that can search a given value from an array that is ordered in ascending order by implementing binary search technique.

18. Write a function to delete one duplicate value in an integer array. Using this write a program to delete all duplicate values from same array. **5E12**

19. Write a C program to convert integer to binary and also write flowchart for the same. **4M10**

20. Write a program for following *main()* function: **6E11**

```
void main()
{int A[100], B[100], n1, n2;
 input(A, n1); input(B, n2);
 merge(A, B, n1, n2); //Add elements of B at the end of A
 cout << "Merged array :\n"; display(A, n1+n2);
}
```

21. Given 2 one-dimensional arrays A and B which are sorted in ascending order, write a program to merge them into a single sorted array that contains every item from arrays A and B in ascending order. **5E10**

22. How are multidimensional arrays defined? Compare with the manner in which one-dimensional arrays are defined? State the rules that determine the order in which initial values are assigned to multidimensional array elements?

23. Indicate what values are assigned to the individual array elements –

    int p[2][4] = {1, 3, 5, 7};

24. If an array is defined as int a[10][10]; then what is meant by a[2]? **2E11**

25. Fill in the blanks: **1E12**
    While initialising a two dimensional array, it is necessary to mention the _____ dimension, whereas the other dimension is optional.

26. Write a program, which will read a matrix and print the same.

27. Write a program, which will read a matrix and print the transpose of the same.

28. Write a program, which will read a matrix and shall create and print the transpose of the same.

29. Write a program, which will read a square matrix of order *n* and shall create and print the transpose without using second matrix. The program shall store the transpose in the same memory location as that of original matrix.

30. Write a function for checking the symmetry of a matrix.

31. Write a program to find sum of diagonal elements of 3 x 3 matrix. **6E12**

32. Describe the output of following program: **2E09**

```
#define rows 3
#define columns 4

int z[rows][columns] = {1,2,3,4,5,6,7,8,9,10,11,12};

void main()
{
 int a, b, c = 999;
 for(a=0; a<rows;++a)
 for(b=0; b<columns;++b)
 if(z[a][b]<c)
   c=z[a][b];
 cout << c;
 getch();
}
```

33. WAP to verify transpose law of matrix, $(A \times B)^T = B^T \times A^T$ where order of A is $m \times n$ and B is $n \times m$. **10E10**

34. Write functions for following operations:

(i) Matrix reading
(ii) Matrix addition
(iii) Matrix transpose
(iv) Matrix multiplication
(v) Matrix printing

Write a *main()* function which will read elements of matrices A, B and C each of order $m \times n$. Using the above functions compute matrix D such that

$$D = (A + B)^T * C$$

The program should print matrix D.

35. Write a program to add two user entered matrices. **5M13**

36. WAP to multiply two rectangular matrices after applying condition. **10E11**

37. Write a C++ program for the multiplication of matrices of the 3 x 3 order. **4E13**

38. Write a C++ program for matrix multiplication. **10E13**

39. Write a C++ program to read the elements of the two matrices and perform matrix multiplication. **10M13**

40. If the array definition is A[5][5]; and it is passed as an argument to a function, then what is the minimum syntax required in () of declaration of that function? **1E11**

41. Pascal triangle is obtained by generating binomial coefficients ${}^{n}C_{r}$. WAP to generate following Pascal triangle: **5M11**

```
                1
              1   1
            1   2   1
          1   3   3   1
        1   4   6   4   1
```

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Chapter 7. Pointers

1. What is meant by the address of a memory cell? How addresses are usually numbered? How is a variable's address determined?

2. What is a pointer? How it is declared? What is its use? Explain the concept with suitable examples? Are integer values ever assigned to pointer variables? Explain. What operations can be carried out on pointer variables and object variables?

3. Explain the following operators in brief.

   i) Address Operator
   ii) Indirection Operator

4. A C programs contains the following statements

```
int i, j  = 25;
int *pi, *pj = &j;
*pj=j + 5;
i = *pj + 5;
pi = pj;
*pi = i+j;
```

Suppose each integer quantity occupies two bytes of memory. If the value assigned to *i* begins at hexadecimal address F9C and the value assigned to *j* begins at address F9E then answer the following questions.

(i) What is the value represented by *pi* and *&j*?
(ii) What is the value assigned to *pj*, **pj* and *i*?

Illustrate your answers using proper memory diagrams.

5. Determine the output of following program segments:

```
main()
{       int a, b, *P1, *P2, x, y;
        a = 12; b = 4; P1 = &a; P2 = &b;
        x = *P1 * *P2 – 6;
        *P1 = *P1 + *P2;
        y = (*P1 / *P2) + 10;
        cout << endl << *P1 << '\t' <<  *P2;
        cout << endl << a << '\t' <<  b;
        cout << endl << x << '\t' <<  y;
}
```

6. What is sending argument by reference? Explain with programming example, how it is used in C and C++? **8E10**

7. What is sending argument by reference? WAP to swap values of two variables using function. Use one argument by C concept and other by C++. **8E10**

8. What is a function? What are the advantages of using a function? With the help of C++ programs, explain the following: **10M12**

   (a) Call by value (b) Call by address

9. Write a C++ program for swapping the values of two integers using **10E12**

   (a) Pass by value (b) Pass by address

10. Explain the following concepts with help of suitable programs: **10E13**

    (a) Pass by value (b) Pass by reference

11. What is the output of following statements? Give reason. **3M11**

```
#include <iostream.h>

int x = 10;

void ex(float* p, int b, char& c)
{
cout << "\nA = " << (*p)++ << "\tB = " << b-- << "\tC = " << c++;
}

void main()
{
 char ch = 'c'; float m = 5.5;
  ex(&m, x, ch);
 cout << "\nM = " << m << "\tN = " << x <<"\tChar = " << ch;
}
```

12. What is the output of the following codes? Support your answer either by calculation or by justification. **5E11**

```
#include <iostream.h>

int x = 10;
void f(int*, int);

void main()
{
int a = 22, b = 44;
f(&a, b);
cout << endl << a << '\t' << b<< '\t'<< x;
}
```

```
void f(int* p, int x)
{
*p = 100;
p = &x;
cout << x << '\t'<< *p;
}
```

13. What is the relationship between an array name and a pointer?

14. State true or false giving reason. Credit will be given only with correct reason. **1E10**
    If two arrays are defined as int A[10], B[10]; then statement A = B; copies elements in array B[] into array A[].

10M12

10E12

0E13

M11

E11

10

What is the output of following codes? If code is not executable, state errors. 5E10

15.
```
#include <iostream.h>
int& sample(int b, int &a, int *p)
{a=a==b;
 cout << p[2] << '\t' << *(++p);
 return a;
}

void main()
{int a = 10, b = 20, A[] = {2,4,6,8,10};
 if(sample(a,b,A))cout <<'\n'<<A[0]<<'\t'<<A[4];
 else cout<<'\n'<<a<<'\t'<<b;
}
```

5E12

16.
```
#include <iostream.h>
void sample(int& m, int *p, int n)
{p=&n;  *p = m; m = n;
 cout << '\n' << m << '\t' << n;
}

void main()
{int a = 10, b = 20, c = 30;
 sample(a,&b, c);
 cout<<'\n'<<a<<'\t'<<b<<'\t'<<c;
}
```

17. What is dynamic memory allocation? 2E09

18. Differentiate between *new* and *delete* operators

19. What is required to be done if dynamic array is to be expanded? WAP to merge two sorted arrays into one using dynamic memory allocation. 8E10

20. How can the indirection operator be used to access multi-dimensional array element?

21. Write a function that receives a sorted array of integers and an integer value and insert the value in its correct place using pointers. 5E10

22. How is a multidimensional array defined in terms of a pointer to a collection of contiguous arrays of lower dimensionality? How can the indirection operator be used to access a multidimensional array element?

23. Determine *true* or *false* for the following statements. 1E12
If an array is defined as int A[10][10]; then the values of A and &A[0] are same.

24. State true or false giving reason. Credit will be given only with correct reason. 1E10
When two dimensional array is sent to function, argument in definition contains size in second[].

25. Explain the following pointer operations with appropriate examples. 10E12
ptr++, *ptr--*, *++ptr*, *--ptr*, **ptr++*, **++ptr*, *(*ptr)++*, *++(*ptr)*
where *ptr* is a pointer to a float variables.

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