Section A – 25 Questions (25 Marks)
Multiple Choice Questions, No Negative Marking, No Partial Marking. 1 Mark for each correct answer

1. Which of the following numbers doesn't fit the below series.
   343, 512, 729, 1000, 1329

   a. 512
   b. 343
   c. 1329
   d. 729

2. If in a certain language PROSE is coded as PPOQE, how is LIGHT coded in that code ?
   a. LIGFT
   b. LGGFT
   c. LGGHT
   d. LLGFE

3. Raghu tosses a coin 6 times. The probability that the number of times he gets heads will not be greater than the number of times he gets tails is.

   a. 21/64
   b. 3/32
   c. 41/64
   d. 21/32

4. If Praveen and Naveen together can complete a piece of work in 15 days and Naveen alone in 20 days, in how many days can Praveen alone complete the work?
   a. 60
   b. 45
   c. 40
   d. 30

5. A boat running upstream takes 8 hours 48 minutes to cover a certain distance, while it takes 4 hours to cover the same distance running downstream. What is the ratio between the speed of the boat and speed of the water current respectively?
   a. 2:1

b. 3:2
c. 8:3
d. Cannot be determined

6. Abhi and Vabby take part in a 100 m race. Abhi runs at 5 kmph. Abhi gives Vabby a start of 8 m (meaning Abhi starts the race when Vabby has already covered 8m) and still beats him by 8 seconds. The speed of Vabby is:
   a. 5.15 kmph
   b. 4.14 kmph
   c. 4.25 kmph
   d. 4.4 kmph

7. A bag contains 2 red, 3 green and 2 blue balls. Two balls are drawn at random. What is the probability that none of the balls drawn is blue?
   a. 10 / 21
   b. 11 / 21
   c. 5 / 7
   d. 2 / 7

8. There is a 60% increase in an amount in 6 years at simple interest. What will be the compound interest for Rs. 12,000 after 3 years (compounded annually) at the same rate?
   a. 2160
   b. 3120
   c. 3972
   d. 6240

9. The average temperature for Wednesday, Thursday and Friday was 40 degrees celsius. The average for Thursday, Friday and Saturday was 41 degrees celsius. If the temperature on Saturday was 42 degree celsius, what was the temperature on Wednesday?
   a. 39
   b. 44
   c. 38
   d. 41

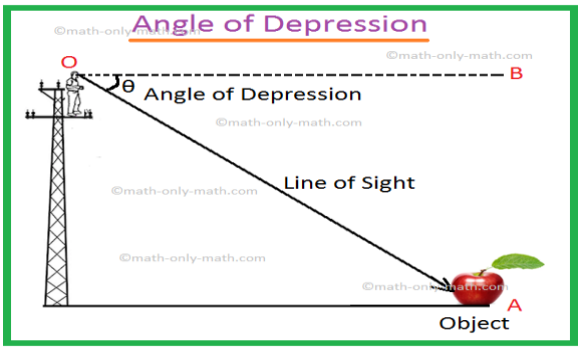
10. A father said to his son, "I was as old as you are at the present at the time of your birth". If the father's age is 38 years now, the son's age 4 years back was:
   a. 34
   b. 23
   c. 15

d. 19

11. The sum of the first 16 terms of an AP whose first term and third term are 5 and 15 respectively is ?
    a. 600
    b. 765
    c. 640
    d. 680

12. . There are two poles, one on each side of the road. The higher pole is 54 m high. From the top of this pole, the angle of depression of the top and bottom of the shorter pole is 30 and 60 degrees respectively. Find the height of the shorter pole. Use the below references of the trigonometric table and angle of depression definition.

	0°	30°	45°	60°	90°
sin θ	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1
cos θ	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0
tan θ	0	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$	$\pm\infty$



    a. 40m
    b. 24m
    c. 36m
    d. Cannot be determined

13. The difference between a two-digit number and the number obtained by interchanging the positions of its digits is 36. What is the difference between the two digits of that number?
    a. 3
    b. 4
    c. 9
    d. Cannot be determined

14. What does f1(8) return for this function.

```
int f1 (int n)
{
    if(n == 0 || n == 1)
          return n;
    else
        return (2*f1(n-1) + 3*f1(n-2));
}
```

a. 1661
b. 59
c. 1640
d. 73

15. What is the output of the below program ?

```
int main()
{
  int a=14;

while(a<20)
  {
    ++a;
    if(a>=16 && a<=18)
    {
      continue;
    }
    printf("%d ", a);
  }
  return 0;
}
```

a. 15 16 17 18 19
b. 15 18 19
c. 15 16 20
d. 15 19 20

16. What does the following program print?

```
int main ()
{
```

```
    int i, j;
    int a [8] = {1, 2, 3, 4, 5, 6, 7, 8};
    for(i = 0; i < 3; i++) {
        a[i] = a[i] + 1;
        i++;
    }
    i--;
    for (j = 7; j > 4; j--) {
         int i = j/2;
         a[i] = a[i] - 1;
    }
    printf ("%d, %d", i, a[i]);
}
```

a. 2, 3
b. 2, 4
c. 3, 2
d. 3, 3

17. What's the output of the following program?. Consider **int** is allocated 2 bytes of memory in the system.

```
int main()
{
        int a = 5, b = 9, c;
        c = a ^ b  // ^ means XOR operator
        c = c << 2 // << Left shift operator
        printf("%d", c);

        return 0;
}
```

a. 0
b. 14
c. 48
d. 144

18. Which one of the following is **not true**?
    a. Kernel is the program that constitutes the central core of the operating system
    b. Kernel is the first part of operating system to load into memory during booting

c. Kernel is made of various modules which cannot be loaded in the running operating system.
d. Kernel remains in the memory during the entire computer session

19. In operating systems, an asynchronous call _____
    a. returns immediately, without waiting for the I/O to complete
    b. does not return immediately and waits for the I/O to complete
    c. consumes a lot of time
    d. is too slow

20. Which of the following is **not true** about Recursion
    a. Program languages internally use the stacks to implement recursion
    b. Recursion decrease the time complexity and space complexity of a program
    c. All recursive programs can be rewritten without recursion using the stacks
    d. Recursive programs result in stack errors (Stack exhaustion) when termination statements are not defined properly.

21. Below is a piece of code to traverse the elements of a binary tree. Which traversal does this do?

```
public void traverse(Tree root)
{
        If (root == null) {
                return;
        }

        traverse(root.left());
        traverse(root.right());
        printf("%d", root.data());
}
```

    a. Pre Order Traversal
    b. Post Order Traversal
    c. In Order Traversal
    d. Level Order Traversal

22. Which of the following is **not true** for the following code segment?

```
class A
{
```

```
        private : int sum(int x, int y)
        {
                return x+y;
        }
        public: A()
        {
        }

        A(int x, int y)
        {
                Cout << sum(x,y);
        }
};
```

a. Constructor can be created with zero argument
b. Constructor prints sum, if two parameters are passed with object creation
c. Constructor will give error if float values are passed
d. Constructor will take 0 as default value for parameters if not passed and prints 0 as sum

23. Which of the following statements is **incorrect** regarding call by value and call by reference parameter passing techniques.

a. In call by value, the value of the actual parameter is copied and the copy is passed to the function.
b. In call by value, actual parameters and functions formal parameters point to the same memory location
c. In call by reference, actual parameters and functions formal parameters point to the same memory location.
d. In call by reference, any modifications to the parameters will be reflected in the calling function.

24. Which key declares that an index in one table is related to that in another?

a. Primary
b. Foreign
c. Secondary
d. Relational

25. Which of the following should be used to find all the courses taught in the Aug 2020 semester but not in the Jan 2021 semester?

a. SELECT COUNT (DISTINCT ID) FROM takes WHERE (course id, sec id, semester, YEAR) IN (SELECT course id, sec id, semester, YEAR FROM teaches WHERE teaches.ID= 10101);
b. SELECT DISTINCT course id FROM SECTION WHERE semester = ’Aug’ AND YEAR= 2020 AND course id NOT IN (SELECT course id FROM SECTION WHERE semester = ’Jan’ AND YEAR= 2021);
c. SELECT DISTINCT course_id FROM instructor WHERE name NOT IN (’Aug’, ’Jan’);
d. SELECT course id FROM SECTION WHERE semester = 'Jan' AND YEAR= 2021);

Section B – 5 Questions (25 Marks)
Questions 26,27,28 – Fill-in-the-blanks : Each question carries 3 marks Question 29 – Coding – 6 marks Question 30 – Coding – 10 marks

26. Reverse a string using recursion. Choose an option to complete.

```
void reverse(const string & str) {
    size_t numOfChars = str.size();

        if(numOfChars == 1) {

            cout << str << endl;

        } else {

            cout << str[numOfChars - 1];

            reverse( _____FILL_IN_THE_BLANK_____);

        }

    }
```

27. Function to convert octal number to decimal. Choose an option to complete.

```
int octalToDecimal(int octalNumber)
{
   int decimalNumber = 0, i = 0, rem;
   while (octalNumber != 0)
   {
      rem =  octalNumber % 10;
      octalNumber /= 10;
      decimalNumber += ___ FILL_IN_THE_BLANK ___;
      ++i;
   }
   return decimalNumber;
}
```

28. The following program finds the maximum value contained in the array P of size n (n > 1). Please complete this program by filling the blank.

```
int a=0, b=n-1;
while (___ FILL_IN_THE_BLANK ___)
 {
    if (p[a] <= p[b])
    {
       a = a+1;
    }
    else
    {
       b = b-1;
    }
  }

printf("Max value is %d",p[a])
```

29. Write a function that takes 2 arguments: numberList (array of integers), baseLine (integer) and prints the count of elements in numberList that is less than baseLine and count of elements in numberList that is more than baseLine. Eg: numberList={10,20,30,40,50,60} and baseLine=45, output should be

    Below BaseLine : 4

    Above BaseLine: 2

    Note: You can write the code in Java or Python

    .

30. Write a program that takes a path to a file name as an argument (.txt file), reads the file and generates a new file that has every alternate line swapped. In the new file, line 2 is line 1 of original file, line 3 of new file is line 4 of original file, line 4 of new file is line 3 of original file and so on. In addition to the output, weightage will be given to program structure, code optimization, error handling, boundary conditions etc.

    Note: You can write the code in Java or Python