Sample Question Paper for MSc Computer Science

- **Format of the Entrance Test Paper**
- The duration of the Entrance Test will be 2 hours and the question paper will consist of 80 multiple choice questions divided into two parts.

- **PART A:** It will have **20 multiple choice** questions of **two marks each** on the following areas of Mathematical Science:
- ***Set Theory and Algebra***: Sets, Relations, Functions, Groups, Partial Orders, Lattice, Boolean Algebra.
- ***Combinatorics***: Permutations, Combinations, Counting, Summation, Binomial Theorem, Exponential Series.
- ***Matrix***: Basic Concepts, Types of Matrices, Determinants, Transpose, Inverse and Rank of a Matrix, Matrix Algebra, Systems of Linear Equations.
- ***Calculus***: Limit, Continuity and Differentiability, Mean Value Theorems, Theorems of Integral Calculus, Evaluation of Definite and Improper Integrals, Partial Derivatives, Total Derivatives, Maxima and Minima.
- ***Ordinary Differential Equations***: First Order First Degree Equations, Variable Separable Method, Homogeneous Equations, Exact Equations, Integrating Factors, Linear Equations.
- ***Vector Analysis***: Addition, Subtraction, Dot Product and Cross Products of Vectors.
- **PART B:** It will have **60 multiple choice questions** of **one mark each** on the following areas of undergraduate level Computer Science:
- ***Programming in C***: Elements of C, Identifiers, Data Types, Control Structures, Array, Structure, Union, Strings, Pointers, Functions, Parameter Passing to Functions, Recursion, File Handling.
- ***Data Structures & Algorithms***: Elementary Concepts of List, Stack, Queue, Tree and Graph, Space and Time Complexity Analysis, Sorting Techniques: Bubble Sort, Insertion Sort, Selection Sort, Merge Sort, Quick Sort, etc., Searching Techniques: Linear and Binary Search.
- ***Database Management System***: Basic Concepts, Attributes, Entity and Relationships, ER Diagram, Database Decomposition and Normalization, Database Constraints, Relational Algebra, SQL.
- ***Digital Logic and Computer Architecture***: Number System, Data Representation, Compliments, Computer Arithmetic, Logic Gates, Combinational and Sequential Circuits, Computer Organization, Instruction Formats and Addressing Modes, Memory Organization and I/O Interfaces.
- **Negative Marks for Wrong Answers**
- If the answer given to any of the Multiple Choice Questions is wrong, ¼ of the marks assigned to that question will be deducted.

- This is only a sample paper and only meant to be indicative of the type of questions that will be asked.

PART A

(*Twenty Questions. Each Question Carries 2 Marks*)

1. Which one of the following in NOT necessarily a property of a Group?

   a. Commutativity

   b. Associativity

   c. Existence of inverse for every element

   d. Existence of identity

2. The cardinality of the power set of {0, 1, 2 . . ., 11} is .

   a. 2048

   b. 2043

   c. 4096

   d. 4098

3. If, $A = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 0 \\ 1 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 \\ 1 & 0 & 1 & 1 \end{bmatrix}$.

Which of the following is the Boolean product of A and B?

a. $\begin{bmatrix} 1 & 1 & 1 & 0 \\ 0 & 1 & 1 & 0 \\ 1 & 1 & 1 & 0 \\ 1 & 0 & 1 & 1 \end{bmatrix}$

b. $\begin{bmatrix} 1 & 1 & 0 & 1 \\ 0 & 1 & 0 & 1 \\ 1 & 1 & 1 & 0 \\ 1 & 0 & 1 & 1 \end{bmatrix}$

c. $\begin{bmatrix} 1 & 1 & 0 & 1 \\ 0 & 1 & 1 & 0 \\ 1 & 1 & 1 & 0 \\ 1 & 0 & 1 & 1 \end{bmatrix}$

d. $\begin{bmatrix} 1 & 1 & 1 & 0 \\ 0 & 1 & 1 & 0 \\ 1 & 0 & 1 & 1 \\ 1 & 0 & 1 & 1 \end{bmatrix}$

4. Let R denote the set of real numbers. If $f:R\times R\rightarrow R\times R$ is a bijective function defined by $f(x,y)= (x+y,x-y)$, then which of the following is the inverse function of f?

a. $f^{-1}(x,y)=\left(\frac{1}{x+y},\frac{1}{x-y}\right)$

b. $f^{-1}(x,y)=(x-y,x+y)$

c. $f^{-1}(x,y)=\left(\frac{x+y}{2},\frac{x-y}{2}\right)$

d. $f^{-1}(x,y)=(2(x-y),2(x+y))$

5. For the matrix $\begin{bmatrix} 4 & 2 \\ 2 & 4 \end{bmatrix}$, the eigenvalue corresponding to the eigenvector $\begin{bmatrix} 101 \\ 101 \end{bmatrix}$ is_____.

a. 2

b. 6

c. 4

d. 8

6. If $A=[a_{ij}],1\leq i,j\leq n$ with $n\geq 3$ and $a_{ij}=i.j$, then the rank of A is

a. 0

b. 1

c. n-1

d. n

7. The following systems of equations

$$x_1 + x_2 + 2x_3 = 1$$
$$x_1 + 2x_2 + 3x_3 = 2$$
$$x_1 + 4x_2 + ax_3 = 4$$

has a unique solution. The only possible value(s) is/are:

a. 0

b. Either 0 or 1

c. One of 0, 1 or -1

d. Any real number other than 5

8. The value of the determinant $\begin{vmatrix} 1 & 0 & 0 & 0 \\ 16 & 1 & 0 & 0 \\ 16 & 32 & 1 & 0 \\ 16 & 32 & 96 & 1 \end{vmatrix}$ is

a. 1
b. 0
c. 32
d. 96

9. In how many different ways can 4 letters be placed inside four differently addressed envelopes so that no letter gets into its correct envelope?

a. 9

b. 24

c. 6

d. 27

10. The coefficient of x^3 in $(1+x+x^2+x^3)^3$ is

a. 3

b. 12

c. 6

c. 10

11. If $S_1 = \sum n,\ S_2 = \sum n^2, S_3 = \sum n^3$, then the value of $\lim_{n\to\infty} \frac{S_1\left(1+\frac{S_3}{8}\right)}{S_2^2}$ is equal to:

    a. $\frac{3}{32}$

    b. $\frac{3}{64}$

    c. $\frac{9}{32}$

    d. $\frac{9}{64}$

12. Let f be a differentiable function satisfying the condition $f\left(\frac{x}{y}\right) = \frac{f(x)}{f(y)}$ for all $x, y\ (\neq 0) \in \mathcal{R}$ and $f(y) \neq 0$. If $f'(1) = 2$, then $f'(x)$ is equal to:

    a. $2\,f(x)$

    b. $\frac{2\,f(x)}{x}$

    c. $2\,xf(x)$

    d. $\frac{f(x)}{x}$

13. For which of the following, the minimum value of $a\tan^2 x + b\cot^2 x$ equals the maximum value of $a\sin^2 x + b\cos^2 x$, where $> b > 0$?

    a. $a = b$

    b. $a = 2b$

    c. $a = 3b$

    d. $a = 4b$

14. If $\frac{dy}{dx} = \sqrt{\tan x} + \sqrt{\cot x}$, then y is equal to:

    a. $\sin^{-1}(\sin x - \cos x) + C$

    b. $\sqrt{2}\sin^{-1}(\sin x - \cos x) + C$

    c. $\sqrt{2}\cos^{-1}(\sin x - \cos x) + C$

    d. $\cos^{-1}(\sin x - \cos x) + C$

15. The order of the differential equation whose solution is $y = a\cos x + b\sin x + Ce^{-x}$ is

a. 3

b.2

c. 1

d. none of these

16. Suppose, ABCD is a parallelogram with AC and BD as diagonals. Then, $\overrightarrow{AC} - \overrightarrow{BD}$ is equal to

a. $2\overrightarrow{AC}$

b. $\overrightarrow{AB}$

c. $2\overrightarrow{AB}$

d. $\overrightarrow{AC}$

17. If $\vec{e_1} = (1,1,1)$, $\vec{e_2} = (1,1,-1)$ and $\vec{a}, \vec{b}$ are two vectors such that $\vec{e_1} = 2\vec{a} + \vec{b}$ and $\vec{e_2} = \vec{a} + 2\vec{b}$, then the angle between $\vec{a}$ and $\vec{b}$ is

a. $\cos^{-1}\left(\frac{-7}{11}\right)$

b. $\cos^{-1}\left(\frac{7}{11}\right)$

c. $\cos^{-1}\left(\frac{7}{9}\right)$

d. $\cos^{-1}\left(\frac{6\sqrt{2}}{11}\right)$

18. Given that $|\vec{a}| = 2\sqrt{2}$, $|\vec{b}| = 3$ and $\vec{a}.\vec{b} = \frac{\pi}{4}$ the length of the longer diagonal of the parallelogram constructed on $5\vec{a} + 2\vec{b}$ and $\vec{a} - 3\vec{b}$ is

a. 15

b. $\sqrt{113}$

c. $\sqrt{593}$

d. $\sqrt{369}$

19. Given $\mathbf{x} = 3i - j + 2k,\ \mathbf{y} = 2i + 2j - k$. then $x \times y$ is equal to

a. $-3i + 7j + 8k$
b. $5i + j + k$
c. $i - j + 3k$
d. $6i - 2j - 2k$

20. If vector $\mathbf{u} = (3, -12, 4)$, then $||\mathbf{u}||$ is equal to

a. 13
b. 12
c. 19
d. 5

PART B

Each Question Carries 1 Mark)

21. What is the size of () in C?

a. Macro
b. Function
c. None of these
d. Operator

22. What is the output of the following program?

```
#include<stdio.h>
int main()
{
    extern int i;
    i = 20;
    printf("%d", sizeof(i));
    return 0;
}
```

a. 2

b. Undefined reference to i
c. 20
d. 0

23. What is the output of the following program?

```
#include<stdio.h>
int main()
{
    int x = 10;
      {
            int x = 100;
            printf("%d",x);
       }
return 0;
}
```

a. Compilation Error
b. 100
c. 10
d. None of the above

24. Which of the following is executed by preprocess?

a. return 0
b. #include<stdio.h>
c. void main(int argc , char ** argv)
d. None of above

25. What is the output of the following program?

```
#include<stdio.h>
int main()
{
   int a = 320;
   char *ptr;
```

```
    ptr =( char *)&a;
    printf("%d",*ptr);
    return 0;
}
```

a. 64
b. 320
c. 160
d. 60

26. What is the output of the following program?

```
#include<stdio.h>
int main()
{
    int x;
    x=10,20,30;
    printf("%d",x);
    return 0;
}
```

a. Compilation Error
b. 10
c. 30
d. 20

27. In the following program, how many times is South Asian University printed?

```
#include<stdio.h>
void main()
{
    int a = 0;
    while(++a++);
        {
```

```
            printf("South Asian University");
        }
    }
```

a. Only once
b. Infinite times
c. Error: Lvalue Required
d. Only Twice

28. What is the output of the following program?

```
#include<stdio.h>
void main()
{
    int i;
    for(i=0; i<5; i++);
    printf("%d", i);
}
```

a. 5
b. Compilation Error
c. 1 2 3 4
d. Nothing is printed

29. What is the output of the following program?

```
#include<stdio.h>
void main()
{
   for(; ;)
   printf("Hello World");
}
```

a. Hello is printed infinite times
b. Compilation Error
c. Runtime Error
d. Hello Word is printed only one time

30. What is the storage class for variable A in the following code?

```
#include<stdio.h>
void main()
{
    int A;
    A = 10;
    printf("%d", A);
}
```

a. register
b. extern
c. static
d. auto

31. What is the output of the following program?

```
#include<stdio.h>
int main()
{
   int a = 10, b = 20;
   if(a=b)
   {
      printf("Easy");
   }
   else
      printf("Hard");
   }
   return 0;
}
```

a. Hard
b. Easy
c. Syntax error
d. EasyHard

32. What is the output of the following program?

```
#include <stdio.h>
```

```
int main (int argc, char *argv[])
{
char str1 [] = "Welcome to SAU";
int a = 10;
char str2[12];
sprintf (str2, "%s-%d", str1, a);
printf ("%s", str2);
return 0;
}
```

a. Welcome to SAU-10
b. Compilation Error
c. Welcome to SAU
d. none of the above

33. What is the output of the following program?

```
#include <stdio.h>
void main()
{
    int i,j,k,count;
    count=0;
    for(i=0;i<5;i++)
      {
          for(j=0;j<5;j++)
            {
                count++;
             }
      }
    printf("%d",count);
}
```

a. 25

b. Undefined reference to i
c. 20
d. 0

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#include<stdio.h>
int main()
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      {
            int x = 100;
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       }
return 0;
}
```

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b. 100
c. 10
d. None of the above

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