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# UNIVERSITY OF NORTH BENGAL

B.Sc. Honours 4th Semester Examination, 2023

## SEC1-P2-MATHEMATICS

## (REVISED SYLLABUS 2023)

Time Allotted: 2 Hours | Full Marks: 60

*The figures in the margin indicate full marks.*

**The question paper contains SEC2A and SEC2B.**
**The candidates are required to answer any *one* from *two* papers.**
**Candidates should mention it clearly on the Answer Book.**

## SEC2A

### C-PROGRAMMING LANGUAGE

### GROUP-A

**Answer any *four* questions** 3×4 = 12

1. Describe a High Level Language and what is its difference from a Machine Language.

2. Convert the following into the corresponding C-statements
   (i) $e^x \sin x + x^n - 5e^x$ (ii) $(n!e^a \div r)\cdot(\cos x \div n!)$

3. Using if-else statement, write a C-program to find $Y$ such that $X < Y < Z$, where $X$, $Y$, $Z$ are three real numbers.

4. Point out the errors if any in the following program

```
int main()
{
    int a; float b; int c;
     a = 25; b = 3.5; c = a + b * b – 35 ;
 }
```

   Find the value of $c$ if we print $c$.

5. Find the values of $X$ and $Y$ from the following program segment when $n$ assumes the values 1 and 0;

```
X = 1;
Y = 1;
if (n > 0)
     X = X + 1;
     Y = Y – 1;
printf("%d %d", X, Y);
```

6. Distinguish between the following two statements in C:

| | |
|---|---|
| $a = 5$ ; | $a = 5$ ; |
| $b = ++5$ ; | $b = 5++$ ; |

## GROUP-B

**Answer any *four* questions from the following** 6×4 = 24

7. Write a C-program to print the following output using 'for' loop 6

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

8. Rewrite each of the following without using compound relation 3+3

(i) if (grade < = 59 && grade > = 50)
    second = second + 1;

(ii) if (numbers > 100 || numbers < 0)
    printf("out of range");

9. Give the output 6

```
main()
{
    int m[ ] = {1, 2, 3, 4, 5};
    int X, Y = 0;
    for (X = 0; X < 5; X++)
    {
        Y = Y + m[X];
        if (Y = = 3)
            break;
    }
    printf("%d", Y);
}
```

Now replace 'break' by a suitable statement so that same output is resulted.

10. Determine the output of the following program

```
int f (int n);
main()
{
    int X = 5;
    Y = f (X);
    printf("%d", Y);
}
    int f (int n)
    {
```

```
    int p = 1;
    while (n > 0)
     {
        p = p * X;
        X = X – 1;
      }
       return p;
}
```

11.(a) Give the differences between Global and Local variables. 3+3

(b) The main() is a user defined function. How does it differ from other user defined functions?

12. What are the outputs of the following segments: 6

(i)
```
for (n = 1; n < 10; n + = 2)
   printf("%d", n);
```

(ii)
```
for (n = 1; n < 10; n + = 2);
   printf("%d", n);
```

(iii)
```
n = 1;
while (n < = 10)
{
   printf("%d", n);
   n + = 2;
}
```

## GROUP-C

**Answer any *two* questions from the following** 12×2 = 24

13.(a) Write a program in C to compute $1+\frac{x}{1!}+\frac{x^2}{2!}+\frac{x^3}{3!}+\cdots\cdots+\frac{x^n}{n!}$. 6

(b) What are the differences in feature between #define directive and #include directive ? 6

14.(a) Find the outputs of the following: 6

```
i = 2;
while (i < = X)              (X is an integer)
 {
   if (X% i = = 0)
      printf("%d", i);
   i = i + 1;
 }
```

Now replace the 'while' loop by 'for' to produce same outputs.

(b) Without using array write a C program to scan *n* real numbers and find the biggest of them. 6

15.(a) What happens when an array with specified size is assigned 6

(i) with values fewer than the specified size

and (ii) with values more than the specified size.

(b) Using do-while loop write a C-program to find first digit of an integer. Modify your program to find the first even digit if any, in that integer. 6

16.(a) Discuss about the increment and decrement operators, logical operator and arithmetic operators. 6

(b) Write the difference in the output obtain from the following program segments if we print *i* 2+2+2

(i)
```
i = 2;
  while (X% i ! = 0)
     i++;
```

(ii)
```
i = 1;
do
{
   i++;
}
while (X% i ! = 0);
```

Note that *X* is an integer. If we replace *i* = 2 in the 2nd program, what change in the output is observed.

# SEC2B

## OPERATING SYSTEM : LINUX

## GROUP-A

1. Answer any ***four*** questions: 3×4 = 12

(a) Explain the relation between Linux and Unix in brief. 3

(b) How to copy a file in Linux? 3

(c) What is the importance of following Linux directories? 3

(i) home (ii) bin

(d) How to find where a file is stored in Linux? 3

(e) Are Linux commands case-sensitive? Explain your answer in brief. 3

(f) Briefly explain the history of Linux. 3

## GROUP-B

**Answer any *four* questions** 6×4 = 24

2. Describe briefly the Linux architecture. 6

3. What are file permissions in Linux? Name different types of file systems in Linux. 6

4. What is INODE? Explain its structure in brief. 6

5. What is VI editor? Name different types of modes used in VI editor. Describe these modes in brief. 6

6. Explain how to change file permissions in Linux with suitable example. 6

7. What is GUI and command line interface? 6

## GROUP-C

**Answer any *two* questions** 12×2 = 24

8. (a) Explain ls command with at least four options. 6
   (b) Discuss about various security issues in Linux. 6

9. (a) What are the process states in Linux? Describe in brief. 6
   (b) Write at least six features in Linux OS. 6

10. (a) Write down the steps in formatting a Floppy disk in Linux. 3
    (b) What is root amount? Explain in brief. 3
    (c) Who invented Linux? Explain the history of Linux in brief. 6

11. (a) How do you open a command prompt when issuing a command? 3
    (b) How can you find out how much memory Linux is using? 3
    (c) How do you access partitions under Linux? 3
    (d) How do you insert comments in the command line prompt? 3

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## SEC2A

### GRAPH THEORY

### GROUP-A

**Answer any *four* questions** 3×4 = 12

1. Show that a group of more than two people if shakes hand with each other, then the number of people who shakes hand with other odd number of times is even.
2. Show that every Hamiltonian Graph is 2-connected.
3. Show that every non-trivial tree $T$ has atleast two vertices of degree one.
4. Draw a graph which is both Eulerian and Hamiltonian with justification.
5. Let $G$ be a simple graph of order 10. If it has 7 components, show that the size of $G$ cannot exceed 6.
6. Find the adjacency matrix of the complete bipartite graph $K_{3,3}$.

### GROUP-B

**Answer any *four* questions** 6×4 = 24

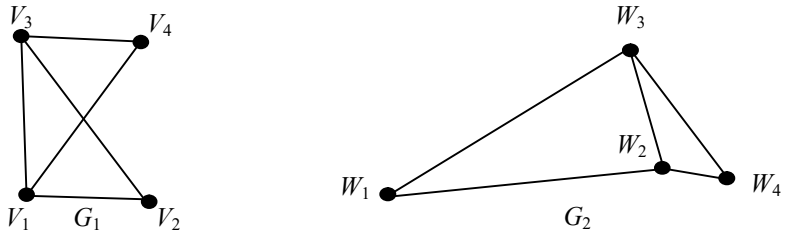
7. Draw two graphs with degree sequence {3, 3, 3, 3, 4}. Find their adjacency matrix and interpret the result.
8. Prove that if a graph has a matching then the cardinality of vertex set is even. Is the converse true?
9. Define a bipartite graph. Prove that the maximum number of edges in a bipartite graph on $n$ vertices is $\frac{n^2}{4}$.
10. If $G$ is a connected graph with $n$ vertices and $n-1$ edges (where $n$ being a positive integer), then prove that $G$ is a tree.
11. Show that a graph $G$ with atleast two vertices is bipartite iff all its cycles are of even length.
12. Let $G$ be a connected graph. Prove that $G$ will be Eulerian graph iff it can be decomposed into circuits.

## GROUP-C

**Answer any *two* questions** 12×2 = 24

13.(a) How many vertices are there in a graph with 15 edges if each vertex is of degree 3? 6

(b) Check whether the following two graphs are isomorphic or not: 6




14.(a) Does there exist a tree of order 15 such that the sum of the degrees of the vertices is 30? Justify. 6

(b) Let $G=(V, E)$ be a Hamiltonian graph and let $V_1$ be any non-empty proper subset of $V$. Prove that the graph $G-V_1$ has at most $|v_1|$ components. 6

15.(a) Draw the graph whose adjacency matrix is given by 6

| | $a$ | $b$ | $c$ | $d$ | $e$ |
|---|---|---|---|---|---|
| $a$ | 0 | 1 | 1 | 0 | 0 |
| $b$ | 1 | 0 | 1 | 1 | 0 |
| $c$ | 1 | 1 | 0 | 0 | 1 |
| $d$ | 0 | 1 | 0 | 0 | 1 |
| $e$ | 0 | 0 | 1 | 1 | 0 |

Find also its complement adjacency matrix and corresponding graph.

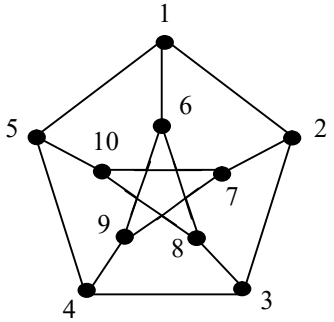
(b) Show that a complete graph with $n$ vertices consists of $\frac{n(n-1)}{2}$ edges. 6

16.(a) A medical representative has to visit five stations, namely $A$, $B$, $C$, $D$, $E$. He does not like to visit any station twice before completing his tour of all stations. The cost for going from one station to another are given below: 6

| | $A$ | $B$ | $C$ | $D$ | $E$ |
|---|---|---|---|---|---|
| $A$ | - | 5 | 8 | 4 | 5 |
| $B$ | 5 | - | 7 | 4 | 5 |
| $C$ | 8 | 7 | - | 8 | 6 |
| $D$ | 4 | 4 | 8 | - | 8 |
| $E$ | 5 | 5 | 6 | 8 | - |

Find minimum cost to travel all the stations.

(b) Show that the following graph is not Hamiltonian: 6



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