



**UNIVERSITY OF NORTH BENGAL**  
B.Sc. Honours 3rd Semester Examination, 2020

**SEC1 (P1)-MATHEMATICS**

Full Marks: 60

**ASSIGNMENT**

*The figures in the margin indicate full marks.  
All symbols are of usual significance.*

**The question paper contains SEC1A and SEC1B. Candidates are required to answer any *one* from the *two* SEC1 courses and they should mention it clearly on the Answer Book.**

**SEC1A**

**C++**

**GROUP-A**

1. Answer *all* questions: 2×6=12
- (a) How to use multiline comment in C++? 2
- (b) Is this program statement valid? 2  
INT = 11.55 ; — Justify.
- (c) Identify the errors, if any, in the following initialization statement: 2  
static int number [ ] = {0, 0, 0, 0}
- (d) Can I use “int” data type to store the value 589462? — Justify. 2
- (e) What is the difference between new ( ) and malloc ( )? 2
- (f) What is ‘ll’ operator and how does it function in a program? 2

**GROUP-B**

2. Answer *all* questions: 5×4=20
- (a) Make a flow chart and write a program in C++ to compute a real root of  $x^2 - a^2 = 0$ , 5  
where  $a$  is any real number.
- (b) Write a loop statement in C++ that will show the following output: 5

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

- (c) Write a C++ algorithm to exchange the biggest and smallest digits of an input number. 5
- (d) What is increment operator in C++? Write the difference between the prefix and postfix notation of increment operator using proper example. 5

**GROUP-C**

3. Answer *all* questions: 7×4=28

(a) What is demonstrated by the following function? 3

```
inline int cube (int s)
{
    return s*s*s;
} int main ( )
{
    cout << "The cube of 3 is :'" << cube (3)
    << "\n";
}
```

Is the above function a number function? Is it possible for the C++ compiler to ignore inlining? 4

- (b) (i) When there are global variable and local variable with the same name? How will you access the global variable? 3
- (ii) Calculate the factorial of a positive integer using ‘while’ loop in C++. 4
- (c) (i) What will be the output of the following program? 4

```
#include <iostream>
using namespace std;
int main ( )
{
    int var;
    for (var = 200; var > = 10; var --)
    {
        cout << "var:" < var << endl;
        if (var == 197)
        {
            break;
        }
    }
    cout << "I am out of the loop";
}
```

(ii) Write the difference between the if-else ladder and switch statement. 3

(d) (i) Write function in 'C++' to obtain Fibonacci triangle as follows: 4

```

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

(ii) Write C++ algorithm to find transpose of a matrix. 3

**SEC1B**  
**LOGIC AND SETS**

**GROUP-A**

1. Answer *all* questions: 2×6=12

(a) Suppose  $A_n = \left\{x \in \mathbb{R} \mid 2 + \frac{1}{n} \leq x \leq 10 - \frac{1}{n}\right\}, \forall n \in \mathbb{N}$ . Find  $\left[\bigcup_{n \in \mathbb{N}} A_n\right]^c$ . 2

(b) Show that  $(A - B)$  and  $(A \cap B)$  are disjoint sets. 2

(c) If  $n(P(P(A))) = 16$ , then find  $n(A)$ . 2

(d) Suppose that  $A, B \subseteq C$ . Can we conclude that  $C \setminus A$  contains  $B$ ? If it is true then prove it. Otherwise, what is the other condition do we need to add in order to make it true? 2

(e) Show that empty set is a subset of all non-null set. 2

(f) Let  $A, B \subseteq U$ . Prove that  $A \subseteq B \Leftrightarrow A \cap B^c = \phi$ . 2

**GROUP-B**

2. Answer *all* the following questions: 5×4=20

(a) Show that the number of reflexive relations on a set of  $n$  elements is  $2^{n^2-n}$ . 5

(b) Prove that  $[0, 2]$  is an uncountable set. 5

(c) Prove that the set  $X = \{n \in \mathbb{N} \mid n \leq \sqrt{5}\}$  is finite but the set  $Y = \{X \in \mathbb{Q} \mid x \leq \sqrt{5}\}$  is infinite. 5

(d) Show that for all set  $A, B, C$ : 5

(i)  $(A - B) - (B - C) = A - B$

(ii)  $\overline{(A - B) - (B - C)} = \overline{A} \cup B$

## GROUP-C

3. Answer **all** the following questions: 7×4=28
- (a) Prove that  $n(A \cup B) = n(A) + n(B) - n(A \cap B)$ . 4+3=7
- Hence Show that
- $$n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(B \cap C) - n(C \cap A) + n(A \cap B \cap C)$$
- (b) (i) Which of the following pair of sets are equal? Give your reasons. 4+3=7
- (I)  $A = \{n \in \mathbb{Z} : 5 < 2n + 1 < 16\}$ ,  $B = \{n \in \mathbb{Z} : 3 \leq n < 8\}$
- (II)  $A = \{n \in \mathbb{R} : x^3 = x\}$ ,  $B = \{x \in \mathbb{Z} : \frac{1}{x} = 1 \text{ or } -1\}$
- (ii) If  $A$  and  $B$  be two finite sets, then prove that  $(A \Delta B)^c = (A^c \cup B) \cap (A \cup B^c)$ .
- (c) (i) Prove that a relation  $\rho$  on a set  $A$  is symmetric, if and only if  $\rho^{-1} = \rho$ . 4+3=7
- (ii) If  $\rho$  be a relation from  $A$  to  $B$  then the domain of  $\rho$  is the range of  $\rho^{-1}$  and the range of  $\rho$  is the domain of  $\rho^{-1}$ .
- (d) (i) If  $A \cap B = \phi$  then prove that  $(B \cap A') \cup B' = S$ , where  $S$  is a universal set. 3+4=7
- (ii) Prove that the set of all even integers is infinite but countable.

—x—