

- (iii) Can you modify the value of the second element in the tuple `my_tuple`? Justify your answer.
- (iv) Write Python code to check if the number 40 exists in `my_tuple` and print "Found" if it exists, otherwise print "Not Found".
- (v) Write Python statement to print alternate values from `my_tuple`.

[This question paper contains 16 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 3528

I

Unique Paper Code : 2344001102

Name of the Paper : Programming with Python

Name of the Course : **GE Computer Science**

Semester : I

Duration : 3 Hours

Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Question 1 in Section A is compulsory.
3. Attempt any 4 questions from Section B.

Section A

1. (a) Draw a flowchart for a Python program that takes an integer input, checks if it is even or odd, and prints the result accordingly. (3)

(b) Identify valid/invalid identifiers from the following :

(3)

- (i) FirstName
- (ii) Total@Amount
- (iii) \$Balance_Sheet
- (iv) class
- (v) _tempValue
- (vi) forEach

(c) Consider the following python code :

(3)

```
employees = {  
    'E101': 'John',  
    'E102': 'Emma',  
    'E103': 'Sophia'  
}  
print(employees[E104])  
employees.update(E105, 'Michael')  
print(employees.get('E106', 'Employee not found'))  
del employees('E102')
```

- (i) Identify all errors in the code.
- (ii) Explain why each error occurs.

(ii) Find and print the largest and smallest numbers in the list.

(iii) Remove any duplicate values from the list and print the updated list in sorted order.

(iv) Calculate and print the sum of all even numbers in the list.

(v) Display the list in the reverse order.

(c) Consider the following Python code :

(5)

```
my_tuple = (10, 20, 30, 40, 50)
```

Answer the following questions based on the code above :

- (i) What is the type of my_tuple? How can you confirm that it is a tuple?
- (ii) Write a Python statement to access the third element of the tuple my_tuple and print it.

Perform the following tasks :

- (i) Print all the keys in the dictionary.
 - (ii) Remove the product "Mouse" from the dictionary.
 - (iii) Print the keys beginning with the character 'M'.
 - (iv) Check if the product "Keyboard" exists in the dictionary. If it does, print its quantity.
 - (v) Print all the values that are less than 10.
- (b) Write a Python program to perform the following operations on a list of integers entered by the user : (5)
- (i) Accept a list of integers from the user (input as a single line of space separated numbers).

- (d) Consider the following dictionary : (3)

```
grades = {'Alice': 85, 'Bob': 90, 'Charlie': 78}
```

Write a Python program to :

- (i) Add a new entry for "David" with a grade of 92.
 - (ii) Update the grade for "Alice" to 88.
 - (iii) Print the contents of updated dictionary.
- (e) Write Python statements to perform the following operations on the string message = "hello world, welcome to Python programming" (3)
- (i) Find the frequency of the character 'o' in the string.
 - (ii) Replace all occurrences of the character T with the character 'z'.
 - (iii) Remove the first occurrence of the character 'e' from the string.

(f) What is the output of the following code? (3)

```
y = [2, 4, 6, 8, 10, 12, 14, 16, 18, 20]
result = 0
for i in y:
    if i % 2 == 0:
        result += i
print(result)
```

(g) What will be the final value of x, y and z when the python code, as shown below, is executed?

(3)

```
x = 12
y = 5
z = 7

x += 5
y *= 2
z -= 3
```

(h) Write Python statements for the following operations : (3)

(i) Concatenate two strings: "Hello" and "World" with a space in between and assign to variable named my_string.

(i) Create a text file named "students.txt" and write the names of 5 students into the file, each on a new line.

(ii) Use exception handling to open the file in read mode and display the contents on the screen. If the file is not found, print "File not found".

(iii) Append the name "John Doe" to the file without deleting the existing content.

(iv) Use a try-except block to handle any errors that may occur while reading the updated content of the file. If an error occurs, print "An error occurred while reading the file".

7. (a) Create a Python dictionary named inventory that stores five product names as keys and their quantities as values. (5)

6. (a) Write a function that accepts two positive integers, a and b and returns a list of all the even numbers between a and b (including a and not including b). (3)
- (b) Write a while loop in python that performs the following tasks : (4)
- (i) Prompt the user to input numbers.
 - (ii) Keep a running total of the numbers entered.
 - (iii) End the input process when the user types "stop".
 - (iv) Display the total sum and the count of all valid numbers entered.
- (c) Write a Python program that performs the following tasks using file handling and exception handling : (8)

- (ii) Slice my_string to extract only the first 5 characters and assign to variable named sliced_string.
 - (iii) Split my_string into a list of words.
- (i) Describe the behavior of the for loop when the step value in range(start, stop, step) is : (3)
- (i) Positive
 - (ii) Negative
 - (iii) Zero (Discuss why using zero as a step value results in an error)
- (j) Examine the Python code snippets below, identify any errors, and provide an explanation for why these errors occur, if applicable, for each part. (3)
- (i) my_tuple = (10, 20, 30)
my_tuple[1] = 40
print(my_tuple)
 - (ii) my_set = {1, 2, [3, 4]}
print(my_set)

(iii) `my_tuple = ("Ram", "Mohan", "Raj")`

`my_set = set(my_tuple)`

`my_set.add("Rahul")`

`print(my_set)`

Section B

2. (a) Write a function to print the following pattern :

(5)

A

B B

C C C

D D D D

E E E E E

(b) Consider the following python code

(5)

`score = 80`

`def calculate (score, bonus = 10) :`

`score = score + bonus`

`return score`

(ii) `for i in range(1, 6):`

`if i == 3:`

`continue`

`print(i)`

5. (a) Write a Python program that uses an if-elif-else statement to determine both the maximum and minimum values among three given numbers.

(4)

(b) Differentiate between the given operators. Illustrate with examples.

(6)

(i) or and and

(ii) = and ==

(iii) is and is not

(c) Write a Python program to calculate the factorial of a given positive integer entered by the user, ensuring that the input is valid and displaying an error message for invalid input.

(5)

(i) Create a tuple with mixed data types:
(10, 'Python', 3.14, True).

(ii) Access and print the second and last elements of the tuple.

(iii) Modify a tuple element and catch the exception raised.

(b) Write a Python function called `count_vowels` that accepts a string as an argument and returns the count of vowels (a, e, i, o, u) in the string. The program should prompt the user to enter a string, pass it to the function, and display the count of vowels. (5)

(c) Write the output of the following Python codes : (4)

(i) `for i in range(1, 6):`

`if i == 3:`

`break`

`print(i)`

What will be the output of following :

(i) `print(calculate(70))`

(ii) `print(calculate(60, 15))`

(iii) `print(calculate(bonus=20))`

(iv) `print(calculate(90, 5, 10))`

(v) `print(calculate(score='Hello', bonus=' World'))`

(c) Consider the Python code snippet below : (5)

```
try:
    num = int(input("Enter a number: "))
    result = 100 / num
    print("Result:", result)
except ValueError:
    print("Invalid input! Please enter an integer.")
except ZeroDivisionError:
    print("Division by zero is not allowed.")
```

What will be the output if the user enters the following inputs :

(i) "abc"

(ii) 0

(iii) 5

Explain why these exceptions occur.

3. (a) Write a Program to Prompt for a Score between 0.0 and 1.0. If the Score is out of range, print an error. If the score is between 0.0 and 1.0, print a grade using the following table (6)

Score	Grade
≥ 0.9	A
≥ 0.8	B
≥ 0.7	C
≥ 0.6	D
< 0.6	F

- (b) Write Python Program that performs the following tasks : (4)

- (i) Open a file named data.csv in read mode. Use exception handling to catch FileNotFoundError and print "File does not exist."
- (ii) Display the contents of the file.

- (c) Consider the following Python code : (5)

```
text = "Learning is a continuous journey"
sub_text = text[9:18]
uppercase_text = text.upper()
contains_journey = "journey" in text
```

Answer the following questions :

- (i) What is the output of `print(sub_text)`?
 - (ii) What is the output of `print(uppercase_text)`?
 - (iii) What is the output of `print(contains_journey)`?
 - (iv) Write python code to check if the word "learning" (case-insensitive) is present in text?
 - (v) What is the output of `print(sub_text)` if `sub_text=text[0:8]`?
4. (a) Write a Python program that performs the following task : (6)

500

This question paper contains 6 printed pages]

Roll No.

--	--	--	--	--	--	--	--	--	--

S. No. of Question Paper : 1558

Unique Paper Code : 2342571101

Name of the Paper : Programming Fundamentals Using C++

Name of the Course : B.A. (Prog.)/B.Sc.(P)/B.Sc. Maths. Sc.

Semester : I

Duration : 3 Hours

Maximum Marks : 90

(Write your Roll No. on the top immediately on receipt of this question paper.)

Section A is compulsory.

Attempt any 4 (four) questions from Section B.

All parts of a question must be answered together.

Section A

1. (a) Differentiate between Object-Oriented Programming (OOP) and Procedural Oriented Programming (POP). 3
- (b) What are the manipulators ? Explain the use of endl and setw() with appropriate example. 3
- (c) Consider the value of $x = 75$ and $y = 15$ for each of the following expression written in C++. What is the value of each expression ? 3
 - (i) $x \% 15 * y$
 - (ii) $(x / 10) \% 5 + y$
 - (iii) $x ++ + y ++$.

P.T.O.

- (d) Convert the following while loop code fragment to an equivalent for loop. 3

```
int x = 5;
while (x != 0)
{
    cout<< x <<endl;
    cin>>x;
}
```

- (e) Explain the following terms : 3

- (i) Data Hiding
- (ii) Encapsulation
- (iii) Abstraction.

- (f) What is exception handling ? List the sequence of events that happen, when an exception occurs ? 3

- (g) Rewrite the following program after removing the syntax error(s) if any. 3

Underline each correction.

```
#include <iostream>
```

```
using namespace std;
```

```
void main( )
```

```
{
```

```
x = 2, y = 4;
```

```
fun 1 (x; y);
```

```
return 0;
```

```
}
```

```
void fun 1 (int a, int b)
```

```
{ a = a + b;
```

```
count << a >> b; }
```

- (h) Name any *three* built in data types used in C++, also write the number of bytes space occupied by them in the memory ? 3
- (i) How does an inline function differ from a preprocessor macro ? 3
- (j) What is the static member function ? What are the characteristics of member function ? Explain with an appropriate example. 3

Section B

2. (a) Write a C++ program to display the following pattern : 5

```
1
2 2
3 3 3
4 4 4 4
5 5 5 5 5
6 6 6 6 6 6
```

- (b) What is the use of constructor in the class ? What are the characteristics of the constructor ? Explain the following constructors with suitable examples : 5
- (i) Default Constructor
- (ii) Parameterized Constructor
- (iii) Copy Constructor.
- (c) What are the characteristics of recursive function ? Write a C++ recursive function to return the sum of 'n' natural numbers. 5

3. (a) Write the output of the following C++ program codes :

10

(i) `int x = 10, y = 5, p, q;`

`P = x > 9;`

`q = x > 3 && y != 3;`

`cout << P << q;`

(ii) `int a = 500, b = 100, c;`

`if (! a >= 400)`

`b = 300;`

`c = 200;`

`cout << b << c;`

(iii) `int x = 1, y = 2, z;`

`z = x++ + ++y;`

`cout << x << " " << y << " " << z;`

(iv) `int a=5, b=9;`

`a=!a;`

`b=!a && !b;`

`cout << a << b;`

(v) `int a=5;`

`do`

`{ cout << a;`

`a=2;`

`}while(a>0);`

(b) Write a program in C++ that display entered string into reverse order.

5

4. (a) Write a C++ program to swap two integer numbers and swap two float numbers using function overloading. 5
- (b) Write a C++ program to count number of spaces present in contents of file. 5
- (c) Write a C++ program to find whether the entered number is even or odd. 5
5. (a) Explain the following terms in reference to C++ language : 10
- (i) Abstract class
 - (ii) Break and Continue
 - (iii) This pointer
 - (iv) Selection control structure
 - (v) Destructor.
- (b) Describe any *three* user defined data types in C++ with examples. 5
6. (a) Explain public, private and protected access specifiers and show their visibility when they are inherited as public, private and protected. 5
- (b) Differentiate the following : 5
- (i) Implicit conversion and explicit conversion.
 - (ii) Private member function and public member function.
- (c) Write a C++ program to declare a class 'employee' with members as empid and empname. Accept and display data for one employee using getdata and putdata member functions. 5

7. (a) Define polymorphism and explain virtual functions with an example. What is the difference between static & dynamic binding ? 5
- (b) (i) What is a pointer ? How is it used in C++ ? Give an example. 5
- (ii) What is derived class ? How is it defined in C++ ? Show with an example.
- (c) Does multiple inheritance leads to ambiguity ? If yes, how can it be removed ? Explain with a suitable example. 5

This question paper contains 4 printed pages]

Roll No.

--	--	--	--	--	--	--	--	--	--

S. No. of Question Paper : 1153

Unique Paper Code : 2342012304

Name of the Paper : Computer Graphics

Name of the Course : B.Sc. (H) Computer Science

Semester : III

Duration : 3 Hours

Maximum Marks : 90

(Write your Roll No. on the top immediately on receipt of this question paper.)

The paper has two Sections A and B. Section A is compulsory.

Attempt any four questions from Section B. Each question is of 15 marks.

Answer all parts of a question together.

Use of non-programmable calculator is allowed.

Section-A

1. (a) Construct a translation matrix to translate a Point P from position (h, k) to the origin. 3
- (b) What does $h = 1$ represent in homogeneous coordinates ? Give example. 3
- (c) What is RGB color model ? How is RGB model represented ? 3
- (d) What is the three-step process to fill a polygon ? 3
- (e) Define the following terms : 3
 - persistence.
 - bitmap
 - refresh rate.

P.T.O.

- (f) What are the drawbacks of DDA line drawing algorithm ? 3
- (g) List the characteristics of key frame animation. 3
- (h) What is the vanishing point in perspective projection ? How is it related to center of projection ? 3
- (i) While scan converting ellipse, explain the use of gradient. 3
- (j) Prove that two rotations are additive. 3

Section-B

2. (a) Consider two Bézier curve segments defined by control points $P_0(20, 20)$, $P_1(40, 50)$, $P_2(60, 20)$ and $P_3(80, 20)$. Another curve segment is defined by $Q_0(a, b)$, $Q_1(c, d)$, Q_2 and Q_3 . Find the point Q_0 and Q_1 such that two curves join smoothly and $C1$ continuity exists between them. 7
- (b) Use the Sutherland-Hodgman polygon clipping algorithm to clip a polygon with vertices $A(1, 1)$, $B(10, 4)$, $C(7, 12)$ and $D(3, 8)$ against a clipping window defined by vertices $(2, 2)$, $(8, 2)$, $(8, 8)$ and $(2, 8)$. 8
3. (a) The triangle ABC with position vectors $[1, 0]$, $[0, 1]$ and $[-1, 0]$, is transformed by transformation matrix, $T = \begin{bmatrix} 3 & 2 \\ -1 & 2 \end{bmatrix}$ to create a second triangle $A*B*C$. Compute the area of new triangle by using area of the original triangle and transformation matrix. 4
- (b) Distinguish between parametric and geometric continuity. 4
- (c) Consider a polygon with vertices PQRS with coordinates $P(2, 3)$, $Q(7, 8)$, $R(9, 4)$ and $S(4, 9)$. Fill the polygon using scan line fill algorithm. Trace the contents of the Active Edge Table for each scan line. 7

4. (a) Rasterize a line segment from (3, 2) to (10, 6) using Bresenham's line drawing algorithm. 7
- (b) Give the 4×4 homogeneous 3D transformation matrix that will achieve the same effect as each of the following transformations : 8
- (i) Rotate counter clockwise about the Z-axis by 45° and then translate right by 3 units.
- (ii) Scale the object by a factor of 2 uniformly along all axes.
- (iii) Find a two-point perspective projection of a line AB with endpoints A(3, 2, 4, 1) and B(3, 2, 8, 1) where the plane of the projection is $z = 0$ and centre of projections are at $y = 2$ and $z = -1$. Also, find two vanishing points.
5. (a) Differentiate between Cabinet and Cavalier projections. 4
- (b) Explain the Area subdivision method for visible surface determination. 4
- (c) Derive the mathematical formula for Phong illumination model considering ambient, diffuse and specular reflection. 7
6. (a) Prove that intersecting lines remain intersecting after generalized 2D transformations. 4
- (b) What do you mean by hidden surfaces ? Explain Z-Buffer algorithm for visible surface determination. 4
- (c) Derive the Basis matrix for parametric cubic Hermite curve. Also, obtain its blending functions. Write two characteristics of Hermite curves. 7

7. (a) Consider a Clip Window PQRS with the coordinates P(100, 100), Q(100, 200), R(200, 200) and S(200, 100). Clip a line A(50, 50) B(250, 300) against this clip window using Cohen Sutherland algorithm. 7
- (b) Explain the architecture of a raster-scan display and its advantages. How long would it take to load a 640×480 frame buffer with 12 bits per pixel, if 1024 bits can be transferred per second ? 4
- (c) What is anti-aliasing ? Explain any *one* anti-aliasing technique in detail. 4

This question paper contains 5 printed pages]

Roll No.

--	--	--	--	--	--	--	--	--	--

S. No. of Question Paper : 1460

Unique Paper Code : 2342572301

Name of the Paper : Computer System Architecture

Name of the Course : B.A.(Prog.)/B.Sc.(P)/B.Sc.(Maths Sc.)

Semester : III

Duration : 3 Hours

Maximum Marks : 90

(Write your Roll No. on the top immediately on receipt of this question paper.)

Section A is compulsory.

Attempt any four questions from Section B.

Parts of a question should be attempted together.

SECTION A

1. (a) What is the role of a cache memory in the memory hierarchy ? 3
- (b) Simplify the following expression using Boolean algebra : 3
 - (i) $AB + A(CD + CD')$
 - (ii) $(BC' + A'D') (AB' + CD')$
 - (iii) $A'B + ABC' + ABC$
- (c) Write down the steps that are required to transfer a new word to be stored in Random Access Memory (RAM). 3
- (d) What are the values of the two control flip-flops, FGI and FGO used during execution of Input and Output instructions ? Write the required microinstructions needed for the execution of the I/O instructions. 3

P.T.O.

- (e) What are overflow and underflow conditions in Arithmetic subtraction ? Explain with a suitable example. 3
- (f) What are flip-flops ? Differentiate between positive and negative edge triggered flip-flops. 3
- (g) Explain the working of a 4-bit adder circuit with a block diagram. 4
- (h) Explain Direct Memory Access (DMA) with help of a block diagram. 4
- (i) Convert the following numbers with the indicated bases to decimal : 4
- (i) $(431)_5$
- (ii) $(52.5)_6$
- (iii) $(246)_8$
- (iv) $(11011011)_2$

SECTION B

2. (a) Explain the working of a Half-Adder with the help of a truth table and draw the logic diagram. 4
- (b) An instruction at address 065 in a basic computer has $I=0$, opcode =ADD and address part a 099. The memory word at 099 contains the value of B8F2 and contents of AC are A937. Implement the instruction cycle and determine the contents of PC, AR, DR, IR and AC registers. Repeat the above when the opcode is AND. 5
- (c) Express the complement of the following functions in sum-of-minterms form : 6
- (i) $F(A, B, C, D) = \sum(3, 5, 9, 11, 15)$
- (ii) $F(A, B, C) = \prod(2, 4, 5, 7).$

3. (a) Explain how parallel processing is implemented through pipeline. 4
- (b) Design a combinational circuit with three inputs and one output. The output is 1 when the binary value of the input is less than or equal to 3 and is 0 otherwise. 5
- (c) Consider a two-word instruction stored in the memory location 400 and 401 as given in the figure below. The first part of the word indicates that this instruction loads a value into AC and the mode field specifies an addressing mode along with the address filed equal to 650. PC has a value 400 and a source register R1 has a value 600. There is also a base register having a value 100. Assume that location 699 contains a value 999, location 700 contains the value 1000. 6

400	Load to AC	Mode
401	650	
202	Next instruction	

Determine the effective address and the operand to be loaded for the following address modes :

- (i) Direct
- (ii) Immediate
- (iii) Indirect
- (iv) Relative address
- (v) Register
- (vi) Autoincrement

4. (a) The initial values in 8-bit registers AR, BR, CR and DR are as following : 5

AR=11110010

BR=11111111

CR=10111001

DR=11101010

Determine the 8-bit value in the register after the execution of the following operations :

(i) $AR \leftarrow AR \text{ (AND) } DR$

(ii) $BR \leftarrow BR + 1$

(iii) $CR \leftarrow AR - CR$

(iv) $DR \leftarrow DR \text{ (OR) } CR$

(v) $BR \leftarrow BR'$

- (b) Draw the block diagram of JK flip-flop along with the characteristic and excitation table. 5

- (c) What are the main characteristics of a Reduced Instruction Set Computer (RISC) and how are they different from Complex Instruction Set Computer (CISC) ? 5

5. (a) Draw the logic diagram and truth table of a 2-to-4 line decoder using only NAND gates with enable input. 5

- (b) What is a GPU and how is it different from CPU in terms of performance and capability ?
Name any *two* applications areas where GPU is more suitable than CPU. 5

- (c) Draw a flow chart of the interrupt cycle and explain its working. 5

6. (a) On the given values of X and Y,

4

$$X = (72)_{10} \text{ and } Y = (89)_{10}$$

Perform $X - Y$ using :

(i) 10's complement subtraction

(ii) 2's complement subtraction.

- (b) Simplify the following Boolean function F with don't care conditions d in sum-of-minterms form. Also draw the corresponding logic diagram :

5

$$F(A, B, C, D) = \sum(0, 6, 8, 13, 14)$$

$$d(A, B, C, D) = \sum(2, 4, 10)$$

- (c) Explain the working of a control unit of a basic computer with the help of a block diagram.

6

7. (a) List the different types of ROM's. How many 128×8 memory chips are needed to provide a memory capacity of 4096×16 ?

4

- (b) Determine by means of a truth table the validity of De-Morgan's theorem for three variables :

5

$$(ABC)' = A' + B' + C'$$

- (c) Write short notes on the following :

6

(i) Indirect memory reference

(ii) Fetch cycle of an instruction

(iii) Programmed I/O.

5843

12

- (ii) Remove the current player from the game and assign the next player in the sequence as the current player. (5)

(500)

[This question paper contains 12 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 5843 I

Unique Paper Code : 32341301

Name of the Paper : Data Structures (under CBCS - LOCF)

Name of the Course : B. Sc. (Hons.) Computer Science (CBCS - LOCF)

Semester : III

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll. No. on the top immediately on receipt of this question paper.
2. Question No. 1 is compulsory and carries 35 marks.
3. Attempt any four questions from Q. No. 2 to Q. No. 7
4. Parts of a question should be attempted together.

P.T.O.

1. (a) What does the following function do? Convert the given function into its equivalent iterative code:

```
int func(int a[], int n, int key)
{
    if(n == 0)
        return -1;

    else if(a[n-1] == key)
        return 1;

    else
        return func(a, n-1, key);
}
```

(5)

- (b) A two-dimensional array A of size 3x4 is to be stored in one-dimensional memory space. Each element requires 4 bytes of memory storage. The base address of the one-dimensional space is 250. Determine the memory location of A [2] [3] when

7. (a) Consider the following keys to be inserted in an AVL tree in the given order:

48, 56, 26, 96, 14, 36

Show the tree after each insertion. What will be the height of the created AVL tree if the leaf nodes have height zero? (5)

- (b) Consider a game that uses a circular linked list to maintain a sequence of players, where each node represents a player. A pointer named "current" points to the player who has the turn. Write functions to do the following:

- (i) Add a new player to the game immediately after the current player.

5843

10

6. (a) Insert the following keys one by one in a B-tree of order

4. 42, 23, 56, 47, 35, 15, 68, 65, 50, 58

Show all the steps involved and the resulting tree.

(5)

- (b) Consider implementing a Double-Ended Queue (DEQUEUE) using either a singly linked list or a one-dimensional array. Which operations of the DEQUEUE (enqueue at front, enqueue at rear, dequeue at front, dequeue at rear) would be affected depending on the choice of the data structure?

Which data structure is more efficient in terms of time complexity for each operation, and why?

(5)

5843

3

the array is stored using the Row Major representation. Also, give the corresponding mapping function. (5)

- (c) Give the necessary class definitions to create a doubly linked list of integers. Write a member function to calculate the sum of the elements of the list. (5)

- (d) Consider a circular queue created using an array of size 5. Perform the following operations in the given order and show the status of the queue after every operation:

enqueue (51), dequeue (), dequeue (), enqueue (35), enqueue (58), enqueue (41), enqueue (11), enqueue (61), dequeue (), enqueue (56)

(5)

P.T.O.

- (e) Insert the following keys in the given order to a hash table of size 19 using a Hash Function $h(k) = k \bmod 19$ and Linear Probing for collision resolution. Show the status of the table after each insertion.

454, 734, 152, 229, 342, 323, 19, 209, 571

State one advantage of storing data using this technique. (5)

- (f) Insert the following keys in an empty Binary Search Tree in the given order.

7, 20, 30, 15, 56, 80, 5, 67

Delete keys 7 and 20 using deletion by copying method. Show all the steps. (5)

```
void f1 (node *p)
{
    if (p == NULL)
        return;
    cout<<p->data;
    f1 (p->next);
}
```

- (ii) Consider the linked list:

54 - 25 -> 38 -> 74 -> 65 -> 57 -> NULL

Give the output of the below function f2 if it is invoked as f2(s) where s is a node pointer pointing to node 25 in the above linked list.

```
void f2 (node *s)
{
    if (s == NULL)
        return 0;

    return 1 + f2 (s->next)
}
```

(5)

5. (a) Write a function that uses a stack to check if a sequence of characters entered by the user forms a palindrome. The length of sequence is given in advance. A palindrome is a sequence that reads the same backward as forward. For example, if the input is a b c c b a, the output should confirm it is a palindrome, whereas if the input is a bbc, the output should confirm it is not a palindrome.

(5)

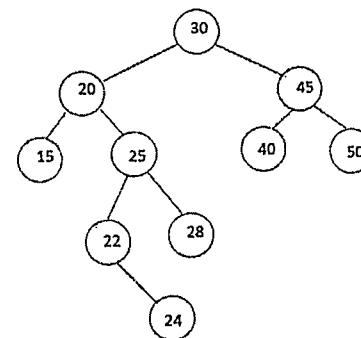
(b) Give output:

(i) Consider the linked list:

56 -> 74 -> 35 -> 67 -> 76 -> 34 -> NULL

Give the output of the below function fl if it is invoked as fl (p), where p is a node pointer pointing to the node 56 in the above linked list.

- (g) Write a function to reverse the value of a given integer variable using a stack. For example, if the value of the integer variable is 5543, the output should be an integer value equal to 3455. (5)
2. (a) For the below binary tree, give the preorder, postorder and inorder traversals of the tree. Is the tree a binary search tree? Justify your answer.



(5)

(b) Build a min-heap using the following data:

P.T.O.

35, 57, 78, 87, 45, 49, 23, 79, 40, 16.

Show the heap after each insertion. Also, remove the root node of the heap and show the resulting tree. (5)

3. (a) Consider a circular queue of integers implemented using an array. Write a member function to do the following:

(i) enqueue an element

(ii) dequeue an element (5)

- (b) Convert the following expression to a parenthesis-free notation using a stack.

$$(P - Q * R) / (A * B - C * D)$$

Show the contents of the stack at every step. (5)

4. (a) Consider searching for a key in a sorted list of numbers. (5)

(i) Suggest an efficient algorithm for the same? State the running time of this algorithm.

(ii) Does the suggested algorithm still work if the ordering of the numbers in the list changes? Why/Why not? If not, suggest an alternative algorithm for the same and state its running time.

- (b) An $n \times n$ diagonal integer matrix A is to be stored in one-dimensional memory space using row-major representation. If the base address of the array A is 750 and each integer takes 4 bytes of memory, find the address of $A[3][3]$ and $A[1][2]$. Also, give the formula to map the $A[i][j]$ element of the array A to the one-dimensional space. Assume that the array indexing starts from 1. (5)

4. (a) Use Line Search method to minimize (10)
 $f(x_1, x_2) = x_1 - x_2 + 2x_1x_2 + 2x_1^2 + x_2^2$ where
 $(x_1, x_2) \in \mathbb{R}^2$.
- (b) How is golden ratio, $c = 1.618$ derived in the Golden Section Rule. (5)
5. (a) Briefly explain any two methods used for finite-difference approximating derivatives? (7)
- (b) Find out the error of function $f(\theta) = \theta^3$ using approximating gradient method. (8)
6. (a) How does an individual determine if a linear programming model has the unique/multiple/infeasible solution when solved using
 I. Graphical Method
 II. Simplex Method?
 Write appropriate reason for each type of solution for each method. (7)
- (b) Find the points on a circle $x^2 + y^2 = 80$, which are the closest and the farthest from (1,2) using Lagrangian method. (8)
7. Use Conjugate Gradient method to minimize
 $f(x_1, x_2) = 3x^2 - 4x_1x_2 + 2x_2^2 + 4x_1 + 6$, where $(x_1, x_2) \in \mathbb{R}^2$
 with (0,0) as an initial solution. Can the Steepest descent method be used for this problem? Give appropriate reason for your answer. (15)

(1500)

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1152

I

Unique Paper Code : 2342012303

Name of the Paper : Numerical Optimization

Name of the Course : B.Sc. (H) Computer Science

Semester : III

Duration : 3 Hours

Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. The paper has two sections A and B. Section A is compulsory.
3. Attempt any four questions from Section B. Each question is of 15 marks.
4. Answer all parts of a question together.
5. Use of non-programmable calculator is allowed.

Section A

1. (a) What is a stationary point on a curve? Explain its three types. (5)

P.T.O.

- (b) Formulate the linear programming problem for the following : (5)

A company produces two types of computers (say A and B). Each computer of the type 'A' requires twice as much production time as that of type 'B'. If all computers are of type 'B' only, the company can produce a total of 500 computers a day. The market limits daily sales of type 'A' and type 'B' to 150 and 250 computers respectively. Assuming that the profit per computer for type 'A' and type 'B' is Rs. 8 (in thousands) and Rs. 5 (in thousands) respectively.

- (c) Solve the following constrained optimization problem using Lagrangian method : (5)

$$f(x) = 2x + y \text{ subject to given constraint } x^2 + y^2 = 1.$$

- (d) Find the point of global and local maxima for the following function : (5)

$$f(x) = x^3 - 12x^2 + 36x + 17 \text{ on the interval } 1 \leq x \leq 10.$$

- (e) Define a Unimodal function. Describe any two methods to optimize a Unimodal function. (5)

- (f) Use Newton's method to minimize $f(x_1, x_2) = 8x_1^2 - 4x_1x_2 + 5x_2^2$ using initial approximation (5, 2). (5)

Section B

2. (a) Define a convex function. Check whether the following function is convex or not

$$f(x, y) = \{x + y \leq 6\}. \quad (5)$$

- (b) Consider the following Linear Programming Problem: (10)

$$\min Z = 3x_1 + 8x_2$$

subject to the following constraints :

$$x_1 + x_2 \geq 8$$

$$2x_1 - 3x_2 \leq 0$$

$$x_1 + 2x_2 \leq 30$$

$$3x_1 - x_2 \geq 0$$

$$x_1 \leq 10$$

$$x_2 \geq 9$$

$$x_1, x_2 \geq 0$$

Solve the given problem graphically and find the optimal solution.

3. Consider the following Linear Programming Problem :

$$\max Z = 2x_1 - x_2 + 3x_3,$$

subject to the following constraints :

$$x_1 - x_2 + 5x_3 \leq 10$$

$$2x_1 - x_2 + 3x_3 \leq 40$$

$$x_1, x_2, x_3 \geq 0$$

- (a) Solve the given problem using Simplex method. (10)

- (b) Check whether it has multiple optimal solutions or not? If yes, find three different optimal solutions. (5)

This question paper contains 4 printed pages]

Roll No.

--	--	--	--	--	--	--	--	--	--

S. No. of Question Paper : 6294

Unique Paper Code : 42344304

Name of the Paper : Operating Systems

Name of the Course : B.Sc. Mathematical Sc./B.Sc. Programme (CBCS-LOCF)

Semester : III

Duration : 3 Hours

Maximum Marks : 75

(Write your Roll No. on the top immediately on receipt of this question paper.)

All parts of Question 1 (Section A) are compulsory.

Attempt any five questions from Section B.

All questions in Section B carry equal marks.

Attempt all parts of a question together.

Section-A

1. (a) How does an Operating System prevent the CPU from being infinitely used by a user program ? 2
- (b) What do you understand by "Convoy Effect" with respect to CPU scheduling ? 2
- (c) Why do programmers use APIs over actual System Calls for reading/writing data on devices ? 2
- (d) List two system calls of an Operating System, each for Process Management and File System Management. 2

P.T.O.

- (e) What is the need of having secondary storage in the computer system ? 2
- (f) What is the “degree of multiprogramming” ? Which scheduler controls the degree of multiprogramming ? 2
- (g) What is the use of a page table in paging memory management ? 2
- (h) Assuming a 1-KB page size, find the page number and offset for the address reference 42095 given in decimal number. 2
- (i) What is an absolute pathname ? Also give an example. 2
- (j) What will be following Unix/Linux commands give as output ? (Here f1, f2, f3, f4 are data files) :
- (i) `cal 5 2024` 1
- (ii) `cat f1 f2 f3 > f4` 1
- (iii) `tail -n 3 f1` 1
- (k) Consider a logical address space of 64 pages with 1024 words per page, mapped onto a physical memory of 32 frames :
- (i) How many bits are required in the Logical Address ? 2
- (ii) How many bits are required in the Physical Address ? 2

Section-B

(Attempt any five)

2. (a) What is dual-mode operation of an Operating-System ? Explain with the help of diagram. 6
- (b) List the *two* advantages and *two* disadvantages of layered approach to system design. 4

3. (a) Define process. Explain different process states with the help of a diagram. 6
- (b) How many processes are created by the following code ? Justify your answer : 4

```
int main()
```

```
{
```

```
    int i;
```

```
    for (i = 0; i < 4; i++)
```

```
        fork();
```

```
    return 0;
```

```
}
```

4. Suppose the following processes arrive for execution at the times indicated below :

Process	Arrival Time	Burst Time (ms)
P1	0.0	8
P2	0.4	4
P3	1.0	1

- (i) Draw Gantt charts that illustrate the execution of these processes using the following scheduling algorithms :

Non-Preemptive SJF, Preemptive SJF and RR (quantum = 2).

6

- (ii) Compute average turnaround time of each process for the Preemptive SJF and Non-Preemptive SJF scheduling algorithms.

2

- (iii) Compute average waiting time of each process for the Non-Preemptive SJF and RR (quantum=2) scheduling algorithms.

2

P.T.O.

5. (a) Consider a paging system with the page table stored in memory where a memory reference takes 100 ns.
- (i) How long does a paged memory reference take ? 2
- (ii) If we add TLBs, and 80% of all page table references are found in the TLBs, what is the effective memory access time ? (Assume that finding the page-table entry in the TLBs takes 0 ns, if the entry is there). 4
- (b) What is external fragmentation ? Explain how can it be reduced ? 4
6. (a) Under what circumstances does a page fault occur ? Describe the steps to handle page fault. Also draw the diagram. 6
- (b) Explain tree structured directory with a suitable example. 4
7. (a) Given memory partitions of sizes 500 KB, 300 KB, 100 KB, 200 KB and 600 KB (in order). How would each of the first fit, best fit and worst fit algorithms place the processes of 250 KB, 350 KB, 100 KB and 426 KB (in order) ? Which algorithm makes the most efficient use of memory and why ? 8
- (b) Name two services provided to user by an Operating System. 2
8. (a) Write Unix/Linux commands for the following : 6
- (i) Count number of occurrences of the word "Unix" in a file F1.
- (ii) Sort the file F2 alphabetically.
- (iii) Display date in the mm/dd/yy format.
- (iv) Copy file "hello.txt" from parent directory to the current directory.
- (v) Give read permission to owner of a file F3.
- (vi) Cut the first field of the output of ls -l.
- (b) Write a shell script to compute factorial of a number N. 4

5768

4

16. Write a C program to copy the contents of one file to another. (2)
17. Discuss the difference between a structure and a union. (2)
18. Contrast the use of *fread* and *fwrite* function. (2)
19. Explain error handling in file input/output operations. (2)
20. What are the different data types in C? (2)

(200)

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 5768

I

Unique Paper Code : 32513902

Name of the Paper : Programming in C

Name of the Course : **B.Sc. (H) Instrumentation
(SEC)**

Semester : III (CBCS Mode)

Duration : 1 Hour

Maximum Marks : 25

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. **Section A** contains 7 questions of 1 mark each, out of which you have to attempt any **five** questions.
3. **Section B** contains 13 questions of 2 marks each, out of which you have to attempt any **10**.
4. Use of a Scientific non programmable calculator is allowed.

P.T.O.

SECTION A

1. What is an assignment statement? (1)
2. Which of the following is not a valid C variable name? (1)
 - (a) int number,
 - (b) float rate,
 - (c) int variable_count,
 - (d) int \$ main
3. How do you access elements in a multidimensional array using pointers? (1)
4. What is the role of header files in C Programming? (1)
5. How is the size of memory block specified? (1)
6. How does a union differ from a structure ? (1)
7. Define a recursive function in C programming. (1)

SECTION B

8. What is the difference between the = symbol and == symbol? (2)
9. What is variable initialization and why is it important? (2)
10. Describe the selection sort algorithms. (2)
11. What are the essential components of a C program? (2)
12. Explain the purpose of each of the following expression : (2)
 - (i) * a-b
 - (ii) a > =b
13. How are command line arguments passed to a C program? (2)
14. What should malloc(0) do? Return a null pointer or a pointer to 0 byte. (2)
15. How do you declare a structure in C? (2)

This question paper contains 6 printed pages]

Roll No.

--	--	--	--	--	--	--	--	--	--

S. No. of Question Paper : 5729

Unique Paper Code : 32343307

Name of the Paper : Programming in Python (SEC)-CBCS-LOCF

Name of the Course : B.Sc. (H) Computer Science

Semester : III

Duration : 2 Hours

Maximum Marks : 25

(Write your Roll No. on the top immediately on receipt of this question paper)

This paper has 2 sections. All questions in section A are compulsory. Attempt any three questions from Section B.

Parts of a question should be attempted together.

Section A

1. Answer the following by choosing the correct option :

10×1=10

(i) Which of the following statements is correct for creating dictionary ?

(a) $d = \{1, 2, 3\}$

(b) $d = [1: 'a', 2: 'b', 3: 'c']$

(c) $d = (1, 'a', 2, 'b')$

(d) $d = \{1: 'a', 2: 'b', 3: 'c'\}$

P.T.O.

(ii) What will be the output of the following :

```
x = 10
```

```
y = 20
```

```
print (f" {x} + {y} = {x + y}")
```

(a) $10 + 20 = 30$

(b) $x + y = 30$

(c) $10 + 20 = 10 + 20$

(d) $10 + 20 = x + y$

(iii) What is the purpose of the self-keyword ?

(a) It is used to define the class name

(b) It refers to the current instance of the class

(c) It is used to call methods from the global scope

(d) It's used to create an alias for an object

(iv) Which of the following statements will raise a SyntaxError ?

(a) `def func(): pass`

(b) `if True: print('Hello')`

(c) `for i in range(5): print(i)`

(d) `x = 5 + *2`

(v) Which of the following data types is immutable ?

(a) List

(b) Dictionary

(c) Set

(d) Tuple

(vi) What will be the output of the following Python code ?

```
x = [1, 2, 3]
```

```
y = x * 2
```

```
print(y)
```

(a) [1, 2, 3, 1, 2, 3]

(b) [2, 4, 6]

(c) [1, 2, 3, 2, 4, 6]

(d) Error

(vii) Which of the following is used to identify a block of code ?

(a) Curly braces { }

(b) Parentheses ()

(c) Indentation

(d) Square brackets []

(viii) What will be the output of the following code ?

```
for i in [1, 2, 3, 4][::-1]:
```

```
print(i, end = ' ')
```

(a) 4 3 2 1

(b) error

(c) 1 2 3 4

(d) 1 3

(ix) What will be the output of the following program ?

```
def addItem(listParam):
```

```
    listParam += [1]
```

```
mylist = [1, 2, 3, 4]
```

```
addItem(mylist)
```

```
print(len(mylist))
```

(a) 5

(b) 8

(c) 2

(d) 1

(x) Which of the following is not a valid variable name ?

(a) My_var

(b) 2myvar

(c) Myvar2

(d) MYVAR

Section B

2. (a) Consider a tuple, T1 such that :

2

T1 = (1, 2, 3, 2, 4, 7)

Write one-liner code for the following :

(i) Convert tuple T1 into a list L1.

(ii) Create a new tuple T2 that contains elements from index 2 to 4 (both inclusive).

(b) Write a function that takes a list as an argument and removes all duplicate elements from that list and returning a new list with only unique elements.

3

2

3. (a) Write the code to create the following dictionary :

Course Names	Fees (in dollars)
Data Science	300
Web Development	250
Machine Learning	350

Further, update the fee for "Data Science" to 1200.

- (b) Use list comprehension to perform the following :

3

(i) Create a list containing all numbers between 1 and 100 that are divisible by 5.

(ii) Create a list where each word in a given sentence is reversed. e.g. :

Input : "Python is fun"

Output : ['nohtyP', 'si', 'nuf']

4. (a) Consider the following code :

2

```
def access_element (L, index) :
    return L[index]
try:
    access_element([1, 2, 3], 5)
except IndexError:
    print("IndexError: List index out of range")
except Exception:
    print("Some other error")
```

What will be the output ?

- (b) Write a program to check if a given number is a perfect square or not.

3

5. (a) Consider the following statement :

2

s = "Welcome to Python"

What will be the output for the following :

- (i) print (s [-6 : -1])
- (ii) print (s, replace ('a', 'o', 2))

- (b) Write a program to count how many times a specific word appears in a given file. 3

6. Define a class *Product* consisting of product name, price, and stock quantity. Use a class variable *total_inventory_value* whose value is evaluated by multiplying price by quantity. Store the total value of all products in the store. Implement methods to update the stock and price. Use a constructor to initialize the name, price, and stock quantity. The destructor should decrease the total value when a product is removed from the inventory. 5

This question paper contains 7 printed pages]

Roll No.

--	--	--	--	--	--	--	--	--	--

S. No. of Question Paper : 1288

Unique Paper Code : 2343012001

Name of the Paper : Python Programming for Data Handling

Name of the Course : Common Prog Group (DSE/GE)

Semester : III

Duration : 3 Hours

Maximum Marks : 90

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt all questions from Section A.

Attempt any four questions from Section B.

All the parts of a question must be answered together.

Section A

1. (a) What is a set data type in Python? Write any two methods applied on set using an example. 3

(b) Give the output of the following code :

```
(i) n = [11,28,31,14,59,16,78,89,10,15]
ctr = 0
for i in range(10):
    if (n[i] >= 50):
        ctr += 1
print(ctr)
```

2

P.T.O.

(ii) `def test(a, b):`
 `a=a+b`
 `b=a-b`
 `a=a-b`
 `print('a= ', a)`
 `print('b= ', b)`

2

`test(6,17)`

(c) Write a function in Python to find the sum of the digits of an integer n passed as an argument.

3

(d) Name the library functions that are applied on the list data type and write the code snippet to perform the following :

(i) Insert an element at the given index

(ii) Sort the elements of the list of values in reverse alphabetical order

(iii) Remove an element from the list

(iv) Append an element to the list.

(e) Write a Python code to create a heterogeneous list of any length. Compute the sum of integer elements in the list (if any). Display all the string elements (if any) present in this list.

4

(f) With example differentiate between :

6

(i) *while* loop and *for* loop

(ii) tuple and dictionary data type

(g) Write the output of the following statements if the given string str is "India is my country. I love India."
4

(i) `print(str[::-1])`

(ii) `print(str.upper())`

(iii) `print(str.islower())`

(iv) `print(str[-8:-1])`

(h) Write a program using Tkinter that creates a simple window with the title "My First Tkinter App" and a label that says "Hello, Tkinter!"
2

Section B

2. (a) Create a Tkinter application that simulates a simple user registration form. The application should have the following :
5

(i) A Frame widget to group the form elements.

(ii) Inside the frame, include :

- A label that says "First Name:" and an associated entry widget for the first name.
- A label that says "Last Name:" and an associated entry widget for the last name.
- A label that says "Email:" and an associated entry widget for the email.

(b) Create a Tkinter application that includes :

5

- A label that says "Enter your name."
- An entry widget where the user can type their name.
- A button labeled "Submit".

Add a callback function to 'Submit' Button. When the user clicks the "Submit" button, the text entered in the entry widget should appear in a new label below the button.

(c) What are the *three* repeating phases of software application development ? Why is it important to gather information from different parties/stakeholders before starting to code/ implement ?

5

3. (a) Evaluate the following expressions :

5

- (i) `abs(-5.4)`
- (ii) `math.floor(67.79)`
- (iii) `x=2+9*((3**3)-8)/5`
- (iv) `5 % 10 + 10 - 25 * 8 // 5`
- (v) `eval("1024" + "1024")`

(b) What is the output of :

6

```
(1) def f1():
      x=15
      print(x)
      x=12
      f1()
```

```
(2) x = [i for i in range(30,10,-3)]  
    for i in x:  
        print(i)
```

```
(3) T = 0.  
    count = 200  
    while count > 50:  
        T += count  
        count -= 10  
    print(T)
```

(c) What is the use of layout manager in Tkinter ? Also, discuss the 'grid' layout manager. 4

4. (a) What is the difference between the following file functions : 6

(i) csv.reader() and csv.DictReader() functions

(ii) f.tell() and f.seek() functions

(iii) f.read() and f.readline()

(b) Write a Python program to create a text file with at least *four* lines about your college using the writelines() function. 5

(c) Explain the need for the following modules in Python. Also, write *two* functions of each : 4

(i) math module

(ii) tkinter module

5. (a) Write a function to compute the factorial of a number which is passed as an argument. 5

- (b) Write a Python program to print the following pattern : 5

1

1 2

1 2 3

1 2 3 4

1 2 3 4 5

Where the number of lines is input by the user. There are 5 lines printed in the above pattern.

- (c) Write a code in Python to check if a string input by the user is a palindrome or not. 5

6. (a) Consider the following function : 5

```
def function1( a = 4, num = 2):  
    return (a **num)
```

Give the output produced for each of the following function calls :

```
print(function1( ))  
print(function1(6))  
print(function1(num = 3))  
print(function1(num = 2, a = 5))  
print(function1(5,3))
```

- (b) Identify the error, if any, in the following code segments. Rewrite the code by underlining the corrections : 6

(i) #Input two integer numbers and print the greater one

```
x=input("Enter first number")
y=input("Enter second number")
If x>y
print("x")
Else
Print("Y")
```

(ii) #FUNCTION

```
def example(a)
a = a + '2'
a = a**2
return a
Example("hello")
```

(c) Write a program to merge two text files named as "file1.txt" and "file2.txt". 4

7. (a) Given a list of numbers, write a Python program to count the number of times an element occurs in a list and create a dictionary with *element: count* as *key: value* pairs. 5

(b) What are the following functions used for ? 10

(i) pop() and popitem() in dictionary

(ii) index() and count() in tuples

(iii) isdigit() and isalnum() in strings

(iv) startswith() and endswith() in string

(v) isupper() and upper()

S. No.	
Unique Paper Code	32513912
Name of the Paper	Artificial Intelligence (SEC)
Name of the Course	BSc(H) Electronics (CBCS-LOCF)
Semester	III
Duration	1 Hours
Maximum Marks	25

Instruction for Candidates

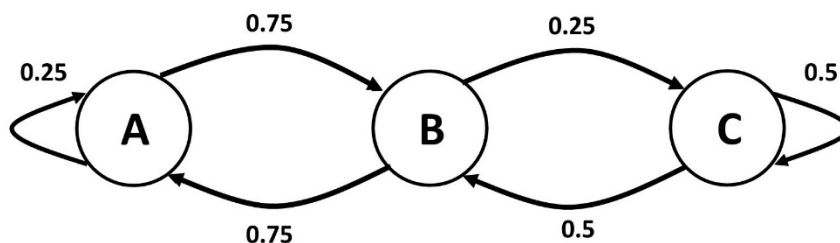
Attempt any five Questions from Part A and any 10 Questions from Part B.

PART A (Attempt any five)

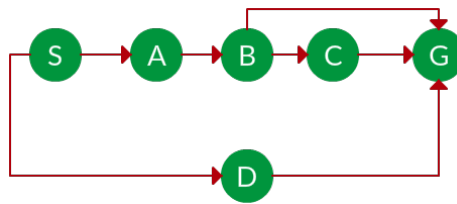
- 1 Differentiate between a tree and a graph. (1)
- 2 What is the full form of MDP in context of AI? (1)
- 3 Briefly explain 'Acting Humanly' approach to AI with a suitable example. (1)
- 4 Define a heuristic function. (1)
- 5 What is the primary purpose of Bayesian Networks? (1)
- 6 What is the difference between the terms Stochastic and nondeterministic? (1)
- 7 PEAS is an abbreviation for? (1)

PART B (Attempt any Ten)

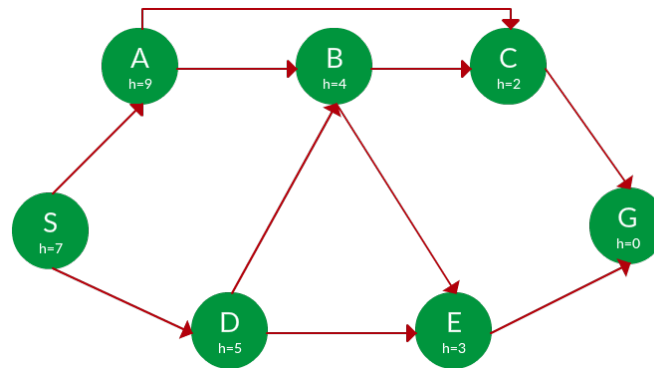
- 1 Describe the role of sensors and actuators in an AI system. (2)
- 2 Formulate a state-space representation for solving a Sudoku puzzle. (2)
- 3 Design a search tree for a Tic-Tac-Toe game up to two levels of depth. (2)
- 4 Consider a Markov chain with 3 states and transition probabilities as shown in figure below: (2)



- 5 Compute the stationary distribution. That is compute $P_{\infty}(A)$, $P_{\infty}(B)$, $P_{\infty}(C)$. (2)
- 6 Solve for $P(A|B)$ given $P(A)=0.3$, $P(B)=0.5$, and $P(A \cap B)=0.2$. (2)
- 7 Explain the Turing Test and list various essential features of this test. (2)
- 7 Determine the optimum solution (best path) that can be obtained for the given search tree to move from **initial state S** to **goal state G** using: (i) Breadth First Search and (ii) Depth First Search Algorithm. (2)



- 8 Find the path from S to G using greedy search. The heuristic values h of each node is given below the name of the node. (2)



- 9 Explain the following terms: (2)
- (i) Omniscience
 - (ii) Autonomy
- 10 What is the computational complexity of A* algorithm, and why? (2)
- 11 What are different types of planning? Explain with example. (2)
- 12 Describe how temporal difference (TD) learning improves over dynamic programming. (2)
- 13 Create a search tree for a simple 8-puzzle problem with an initial move. (2)

This question paper contains 4 printed pages]

Roll No.

--	--	--	--	--	--	--	--	--	--

S. No. of Question Paper : 6264

Unique Paper Code : 42343307

Name of the Paper : Data Analysis using Python Programming (SEC)

Name of the Course : B.Sc. Programme (CBCS-LOCF)

Semester : III

Duration : 2 Hours

Maximum Marks : 25

(Write your Roll No. on the top immediately on receipt of this question paper.)

Section A is compulsory.

Attempt any *three* questions from Section B.

Parts of a question must be answered together.

Assume that libraries numpy and pandas are imported as np and pd respectively.

Section A

(Compulsory)

1. (a) Give the output of the following code :

2

```
a=np.arange(8).reshape(4,2)
print(a)
a[(a>3)]=8
print(a)
```

- (b) What are outliers ? Which statistical plot is used to mark the outliers ?

2

- (c) Find the output that will be produced on the execution of the following code :

2

```
s1 = pd.Series(np.array([1, 2, 3, 4]),
               index=['p', 'q', 'r', 's'])
print(s1)
s1.drop('p', inplace=True)
print(s1)
```

P.T.O.

(d) Write a Python program to plot a line with [2, 4, 6, 8, 9], [5, 2, 7, 8, 2] as x and y axis respectively and mark each point with a green circle of size 16. 2

(e) Find the output that will be produced on the execution of the following code : 2

```
data=pd.DataFrame([[8,17,60],[np.nan,5,10],[np.nan,12,
np.nan],[np.nan,np.nan,np.nan]])
print(data)
print(data.fillna(method='ffill',limit=2))
```

Section B

2. Find the output that will be produced on the execution of the following code : 3+2

(i)

```
a = np.arange(26, 21, -1)
b = np.array([5, 11.1, 2.4, 37.1, 4, 9])
print(a, b)
print(a.dtype, a.shape, a.ndim)
print(np.ceil(b))
```

(ii)

```
data1=pd.DataFrame({'Name':['Ram', 'Rohan']* 2 +
['Rohan'], 'Marks':[21,22,21,23,24]})
print(data1)
data2=data1.drop_duplicates(['Name', 'Marks'],
keep='last')
print(data2)
```

3. (i) Write one difference between loc and iloc methods. 2+3

(ii) Find the output that will be executed on the execution of the following code :

```
record = [[72, 'Operating System'], [49, 'Computer
Graphics'], [80, 'Data Structures']]
names = ['Ayaan', 'Abhav', 'Prisha']
column = ['Marks', 'Subjects']
df = pd.DataFrame(record, names, column)
print(df)
print(df.loc['Ayaan', 'Marks'])
print(df.iloc[2])
```

4. Given the following excel file 'empdata.xlsx' consisting of details of employees : 5

Gender	Department	Salary	Experience
Female	Hindi	87000	7
Female	Hindi	65000	5
Male	Hindi	59000	4
Female	English	92000	8
Male	English	51000	4
Male	English	66000	5
Female	Physics	95000	9
Male	Physics	73000	6

Write Python statements to do the following (Make use of appropriate libraries)

- (i) Read data from the given excel file 'empdata.xlsx' into a dataframe empdata.
 - (ii) Calculate and display the total salary for each department.
 - (iii) Display statistical summary of the numerical attributes only.
5. (i) Write Python code to generate 100 random numbers from 1 to 100 and plot it on the histogram of 5 equal length bins of color black and transparency 0.3. 2+3
- (ii) Write Python statements for the following :

Emp_no.	Name	Experience
101	Mohan	2
102	Sohan	3

- (a) Create a dataframe, df, with columns Emp_no., Name, and Experience having values as given above.
- (b) Rename the columns Emp_no., Name, and Experience of dataframe, df, to A, B and C respectively.
- (c) Add a new column Age to dataframe, df, with values 25, 29.

6. Consider the DataFrame, df1, given below :

5

```
df1 = pd.DataFrame([[0, 1, 2],[4, 5, 6],[4, 5, 7]],index = ['Patiala', 'Jaipur', 'Ahmedabad'],  
columns = ['A', 'B', 'C'])
```

Write Python statement for the following :

- (i) Find the mean and variance of each column in df1.
- (ii) Store df1 into csv file 'city.csv' using appropriate library.
- (iii) Find the cumulative sum of column 'A' in df1 and store in column 'D'.

This question paper contains 7 printed pages]

Roll No.

--	--	--	--	--	--	--	--	--	--

S. No. of Question Paper : 6265

Unique Paper Code : 42343308

Name of the Paper : Introduction to R Programming (SEC)

Name of the Course : B.Sc. (Prog.) Physical Science/Mathematical Science

Semester : III

Duration : 2 Hours

Maximum Marks : 25

(Write your Roll No. on the top immediately on receipt of this question paper)

This paper has 2 sections. All questions in section A are compulsory. Attempt any three questions from Section B.

All parts of a question must be attempted together.

Section A

1. Answer the following by choosing the correct option :

10×1=10

(i) What will the output of the following code be in R ?

```
x <- c(10,12,14,16)
```

```
y <- c(FALSE, TRUE, TRUE, FALSE)
```

```
print(sum(x[y]))
```

(a) 26

(b) 22

(c) True

(d) None of the above

P.T.O.

(ii) What function in R can generate a sequence of numbers ?

- (a) generate_seq()
- (b) seq()
- (c) listseq()
- (d) None of the above

(iii) `x <- list(1, "a", TRUE, list(10, 20), c(1, 2, 3))`

What will the value of `x[4][[1]][[1]]` ?

- (a) 10, 20
- (b) 10
- (c) 20
- (d) Invalid

(iv) What will be the output of the following ?

```
f<- function(x,y) (sqrt(x ^ 4 + y ^ 2) ) f(2,3)
```

- (a) 5
- (b) 6
- (c) 25
- (d) 0

(v) What does the following loop do ?

```
for (i in 1:3) print(i^3)
```

- (a) Prints numbers from 1 to 3
- (b) Prints cubes of numbers from 1 to 3
- (c) Counts from 1 to 3
- (d) None of the above

(vi) Consider the two vectors $x \leftarrow c(1, 2, 3)$ and $y \leftarrow c(4, 4, 6)$, what is produced by the expression `rbind(x, y)` ?

(a) 3×2 numeric matrix

(b) 2×3 numeric matrix

(c) Error

(d) None of the above

(vii) Which function in R is used to install packages from CRAN ?

(a) `install.packages()`

(b) `load.packages()`

(c) `get.packages()`

(d) None of the above

(viii) What will be the output of following R code ?

```
x <- vector ("list", length = 5)
```

(a) 1

(b) 1 2 3 4 5

(c) NULL

(d) None of the above

(ix) What is the output of the following code ?

```
m <- matrix(1:4, nrow = 2, ncol = 2)
dimnames(m) <- list(c("a", "b"), c("c", "d"))
print(m)
```

(a)

	c	d
a	1	3
b	2	4

(b)

	c	d
a	1	2
b	3	4

(c) NULL

(d) None of the above

(x) What is a *geom* in the ggplot2 system ?

(a) A method for mapping data to attributes such as color and size

(b) A plotting object like point, line or other shapes

(c) A statistical object

(d) None of the above

Section B

2. Create a student data frame containing 5 rows and 4 columns as shown below : 5

Name	Roll Number	Course	Percentage (%)
Neha	1234	B.A.	89
Rudra	1235	B.A.	78
Sam	1236	BSc	89
Radhika	1278	BSc	90
John	1290	B.A.	96

Write appropriate R commands to answer the following :

- Find the size of the data frame.
- Calculate the sum and mean of the 'Percentage' column of the data frame.
- Add a new row with the following entries : – "Mary", 1340," BSc", 82.
- Add a new 'Grade' column to the data frame fulfilling the following conditions :

Percentage >90 % –Grade A1

Percentage between 80% and 90% –Grade A

Percentage < 80% – Grade B.

3. There are twenty students selected for a football team with Weight (in kgs) and Height (in cms) as given below : 5

W = c (52, 34, 45, 40, 53, 42, 23, 52, 62, 30, 58, 23, 30, 32, 76)

H = c (152, 175, 188, 176, 153, 142, 123, 112, 152, 70, 154, 103, 110, 132, 176)

P.T.O.

Consider the information given above to answer the following (using R commands) :

- (a) Convert 'H' into 2-factor levels of short and tall with 'H' $\leq$ 130 cms as short and 'H' $>$ 130 cms as tall.
 - (b) Create a histogram for a given weight vector ('W') with 4 bins.
 - (c) Arrange the height of students ('H') in decreasing order.
 - (d) Find a correlation between the height ('H') and weight ('W') of students.
 - (e) Create a contingency table of 'W'.
4. Write R command/s to convert the following 'Student_details.csv' file into a data frame.

Student_details.csv :

5

S.No	Name	Hours of Study	Marks	Subject	Category
1	Honey_Kasi	4	88	Maths	Gen
2	John_Ken	3	82	Science	Gen
3	Shruti_Priya	6	99	Science	Cast
4	Harita_R	8	84	English	Cast
5	Aditya_D	8	95	Maths	Gen

Using the obtained data frame, write R commands to perform the following operations :

- (a) Plot 'Marks' versus 'Hours of Study' using Scatterplot.
- (b) Consider 'Category' as categorical data and create factors on it. Also, determine the factor levels.
- (c) Write an-SQL query in R to find students having 'Marks' more than 90 using the appropriate library.
- (d) Split Name of students based on '_'.

5. Answer the following : 5
- (a) Write an R Script to print the product of the first 10 natural numbers.
 - (b) Using the *sample()* function, simulate the rolling of 6-sided dice (having numbers between 1 and 6) ten times. Calculate the frequency of each value generated.
6. Write R commands to perform the following operations : 5
- Create a 3×3 matrix M1 to store the first 9 whole numbers. Create another 3×3 matrix, M2, with random numbers. Combine these two matrices row-wise. Write a function to calculate the sum of all values in the matrix M1.

This question paper contains 3 printed pages]

Roll No.

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

S. No. of Question Paper : 5774

Unique Paper Code : 32353301

Name of the Paper : LaTeX and HTML

Type of the paper : SEC

Semester : III

Name of the Course : B.Sc. (Hons) Mathematics

Duration : 2 Hours

Maximum Marks : 38

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt all questions.

Part of the questions to be attempted together.

Use of calculator is not allowed.

1. Fill in the blanks :

8×1=8

(i) The command is used to emphasize text in LaTeX.

(ii) The symbol ∞ can be produced in LaTeX using the command

(iii) command is used to create horizontal dots above the line in LaTeX.

(iv) The command to produce name of institute in a beamer presentation is

P.T.O.

- (v) command is used in pstricks to put a label at a specified point.
- (vi) The HTML element is closed with tag.
- (vii) Boldface text on a webpage is obtained with the element.
- (viii) tag is used in HTML to add the largest heading to a paragraph.

5×2=10

2. Answer any *five* parts from the following :

- (i) Write the output of the command :

$$\frac{d}{dx} \left(\int_0^x f(t) dt \right) = f(x).$$

- (ii) Write a set of commands to be put in the main document in LaTeX to produce :

$$\lim_{x \rightarrow \infty} \frac{\pi(x)}{x / \log x} = 1.$$

- (iii) Write a code in LaTeX to get the following :

$$\begin{bmatrix} 5 & 9 & 7 \\ 4 & 2 & 8 \\ 6 & 2 & 3 \end{bmatrix}$$

- (iv) Write the following postfix expressions in the standard form :

sin 1 add 2 exp 1 x sub div.

- (v) Write the command in PSTricks to plot the function $y = \sin x$.

- (vi) What is the use of <a> tag in HTML ? Give its general syntax.

- (vii) What is wrong with the following HTML construction ?

<p> This is bold and italics </p>

3. Answer any *four* parts from the following :

4×5=20

(i) Write the code to typeset the following :

$$|x - 3| = \begin{cases} x - 3 & x \geq 3 \\ -x + 3 & x < 3 \end{cases}$$

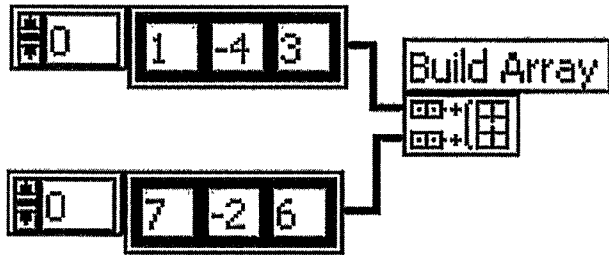
(ii) Write a code in LaTeX to get the following :

$$\begin{aligned} (a + b)^2 &= (a + b) (a + b) \\ &= a (a + b) + b (a + b) \\ &= a^2 + ab + ab + b^2 \\ &= a^2 + 2ab + b^2 \end{aligned}$$

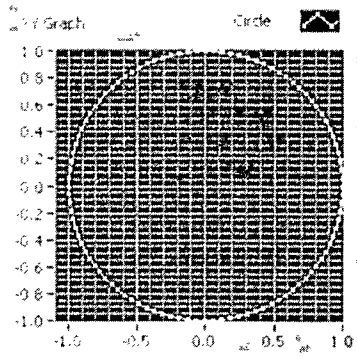
- (iii) Write a code to make a beamer presentation of 5 pages (including title and thank you page) on any topic with diagram/picture.
- (iv) Draw a circle with shaded sector.
- (v) Write an HTML code to generate web page :

University of Delhi

- Skill Enhancement Courses (SEC):
 1. Sec-1 : LaTeX and HTML
 2. Sec-2 : Computer Algebra System
- Discipline Specific Elective (DSE):
 1. DSE-1 : Numerical Methods
 2. DSE-2 : Discrete Mathematics



9. Create a VI to convert a binary number to a decimal number. (2)
10. List the functions of format strings and explain their use. (2)
11. What is VISA? List its advantages. (2)
12. Draw the block diagram that will generate the front panel shown below. (2)



13. How does the motion controller act as the brain of the motion control system? (2)

(200)

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 5772

I

Unique Paper Code : 32513910

Name of the Paper : Virtual Instrumentation (SEC)

Name of the Course : B.Sc. (H) Instrumentation

Semester : III

Duration : 1 Hour

Maximum Marks : 25

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Non-programmable Scientific calculator is allowed.

Section A*Attempt any five questions.*

1. Distinguish between Virtual Instrument and Traditional Instruments. (1)

P.T.O.

5772

2

2. Explain the need for an icon and connector pane. (1)
3. What is meant by polymorphic VI? (1)
4. What is the difference between a Bundle and Bundle By Name functions? (1)
5. What is GPIB? (1)
6. List the type of structures available in LabVIEW. (1)
7. Name the different operations of the cluster. (1)

Section – B

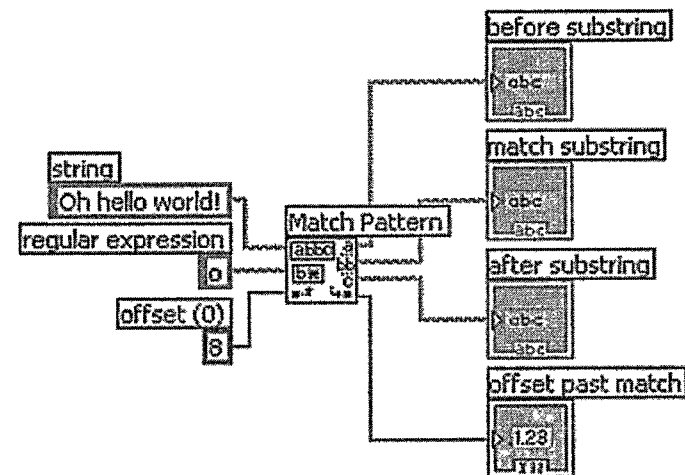
Attempt any ten questions.

1. Write a program in LabVIEW to read a positive number n and to generate the following number series using a For Loop

$$1, 2, 3, 4, \dots, n.$$
 (2)
2. Create a VI to find the factorial of a given number using a while Loop. (2)
3. What is the output before substring, match substring, after substring, and offset past match after the following code executes? (2)

5772

3



4. Explain GPIB communication, configuration, and addressing. (2)
5. Create a VI to find the sum of the following series using a For loop

$$1 + 2 + 3 + \dots + n.$$
 (2)
6. Write a short note on ADC and DAC. (2)
7. Explain the use of Timers and Interrupts in LabVIEW. (2)
8. What is the output of the Build Array function in the following block diagram when concatenate input is selected? (2)

P.T.O.

Use the Naive Bayes classification rule to classify a Red Domestic SUV. Show all the steps involved in the process which include calculating prior probabilities, conditional probabilities, and posterior probabilities and comparing the posterior probabilities.

(b) Differentiate between bagging and boosting ensemble techniques with suitable examples.

(5)

(1500)

[This question paper contains 12 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1199

I

Unique Paper Code : 2343010013

Name of the Paper : Data Mining for Knowledge Discovery (DSE-5)

Name of the Course : **B.Sc. (Prog.) Computer Science**

Semester : V

Duration : 3 Hours

Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. The paper has **two** sections.
3. All questions in '**Section A**' are compulsory.
4. Attempt any **four** questions from '**Section B**'.
5. Parts of a question must be answered together.
6. Non-programmable, basic calculators are allowed.

P.T.O.

SECTION A

1. (i) Indicate whether the following activities can be identified as a Data Mining Task or a Database Query :

Query : (2)

(a) Calculating the revenue for each product category from sales data.

(b) Predicting the future stock price of a company using historical data.

(c) Generating a list of all students who have 12th standard percentage higher than 80.

(d) Clustering customers into different groups based on their buying patterns to target marketing campaigns more effectively.

- (ii) Determine the attribute type of the following :

(2)

Use the k-Nearest Neighbor (k-NN) classifier with $K = 5$ and proximity measure as Euclidean distance to classify a test record ($A = 5$, $B = 5$). Which class would the k-NN classifier assign to the test record?

7. (a) Consider the following training data set for car theft : (10)

Sample No.	Color	Type	Origin	Stolen?
1	Red	Sports	Domestic	Yes
2	Red	Sports	Domestic	No
3	Red	Sports	Domestic	Yes
4	Yellow	Sports	Domestic	No
5	Yellow	Sports	Imported	Yes
6	Yellow	SUV	Imported	No
7	Yellow	SUV	Imported	Yes
8	Yellow	SUV	Domestic	No
9	Red	SUV	Imported	No
10	Red	Sports	Imported	Yes

Compute the Gini index for the overall collection of training data. Compute the Gini index for attribute A and B. Which attribute would the decision tree algorithm choose for the split at the root node? Give reason.

- (b) Consider the following dataset, which consists of 10 records, with two features, A and B, and a binary target class Z. (7)

Record No.	A	B	Z
R1	5	10	+
R2	4	6	+
R3	4	2	+
R4	3	8	+
R5	3	9	-
R6	2	4	-
R7	2	7	-
R8	1	2	-
R9	1	7	+
R10	1	5	+

- (a) Calender Year such as 2000, 2010, 2020, 2030.
- (b) Payment methods such as "cash", "credit card", "debit Card".
- (c) Speed such as 5 km/h, 10 km/h, 50 km/h, 100 km/h
- (d) Severity of Disease such as "mild", "moderate", "severe".

- (iii) What is the difference between predictive tasks and descriptive tasks? (2)
- (iv) What is the difference between noise and outlier? List any two ways to handle the missing values. (3)
- (v) What is the difference between model overfitting and model underfitting? (3)

- (vi) How is an eager learner classifier different from a lazy learner classifier? Support your answer with an example from both category of classifiers. (3)
- (vii) Consider the following data for the feature "Income": (3)
- [20, 40, 10, 30, 60, 100, 200, 300, 400], Discretize the data into three bins using the equal width and equal depth approach.
- (viii) Suppose an attribute marital status has three distinct values {single, married, divorced}. Illustrate the three different ways to perform attribute test condition for the binary split. Also perform for the multiway split. (3)
- (ix) Consider a set of 10 data points in a 2D space given as follows $P_1 = (1, 2)$, $P_2 = (2, 2)$, $P_3 = (2, 3)$, $P_4 = (5, 6)$, $P_5 = (5, 7)$, $P_6 = (6, 6)$, $P_7 = (7, 7)$, $P_8 = (10, 10)$, $P_9 = (10, 11)$, $P_{10} = (20, 20)$. Determine the core points, with $\epsilon = 2$ and $\text{MinPts} = 3$ using DBSCAN clustering technique. (4)

- (b) Draw the logical view of the ensemble learning method. Discuss how ensemble of classification can be constructed by manipulating the input features. (5)
6. (a) Consider the following dataset for binary classification problem (8)

Instance	A	B	C	Target Class
1	T	T	5	+
2	T	T	7	+
3	F	T	8	-
4	F	F	3	+
5	T	F	7	-
6	T	F	4	-
7	F	F	5	-
8	F	T	6	+
9	T	F	1	-

- (b) Describe the situation under which DBSCAN is the preferred method for clustering. Discuss its strengths and weaknesses. (5)

5. (a) Use the distance matrix given below to perform the hierarchical clustering using single link (MIN) and complete link (MAX). Draw the dendrograms which should clearly show the order in which points are merged. (10)

	P1	P2	P3	P4	P5
P1	0.00	0.10	0.41	0.55	0.35
P2	0.10	0.00	0.64	0.47	0.98
P3	0.41	0.64	0.00	0.44	0.85
P4	0.55	0.47	0.44	0.00	0.76
P5	0.35	0.98	0.85	0.76	0.00

- (x) The confusion matrix of a 2-class problem is given below : (5)

		Predicted Values	
		Class = 1	Class = 0
Actual Values	Class = 1	100	25
	Class = 0	50	75

Calculate the accuracy, sensitivity, specificity, true negative rate, and false positive rate.

SECTION B

2. (a) Compute the Minkowski distance from the given table, for $r = 1$ (Manhattan distance), and $r = \infty$ (Supremum distance). (8)

point	X coordinate	Y coordinate
p1	2	4
p2	4	2
p3	3	3
p4	7	3
p5	1	4

(b) Draw the Knowledge Discovery in Databases (KDD) diagram and describe its phases. Discuss briefly four core data mining tasks. (7)

3. (a) For evaluating the performance of a classifier, how does holdout method differ from cross validation?

Consider the data points- D1, D2, D3, D4, D5, D6, D7, D8, D9, and D10 in the dataset. (9)

(i) For a train test split (70, 30) mention a holdout dataset distribution.

(ii) For $k = 5$ mention one possible dataset distribution between training and test partition for k-fold cross-validation.

(b) Discuss the following data preprocessing strategies and techniques with suitable examples. (6)

(i) Aggregation

(ii) Sampling

(iii) Dimensionality Reduction

4. (a) Consider the eight data points P1(3, 11), P2(3, 6), P3(9, 5), P4(6, 9), P5(8, 6), P6(7, 5), P7(2, 3), P8(5, 10). Assume initial centroids (seed points) are P1, P4, and P7. Use k-means algorithm and Euclidean Distance to make these clusters. What will be the three clusters and new centroids after the second iteration? (10)

- (c) Consider the following interleaved transactions T1 and T2, executed concurrently. Assuming the initial value $X=5$ and $Y=10$.

T1	T2
Read_item(X)	
$X = X+10$	
	Read_item(X)
write_item (X)	
	$X=X+Y$
	write_item (X)
Read_item(X)	

Compute the value of X after the given schedule is executed. Is the value of X correct? If we remove the interleaving between the transactions T1 and T2, what will be the value of X? (6)

(1500)

[This question paper contains 16 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 2261

I

Unique Paper Code : 2342573501

Name of the Paper : Database Management Systems

Name of the Course : **B.A. (Prog.) /B.Sc.(P) /B.Sc. Maths. Sc. (NEP-UGCF)**

Semester : V

Duration : 3 Hours

Maximum Marks : 90

Instructions for Candidates

1. Write your Roll. No. on the top immediately on receipt of this question paper.
2. All parts of **Question 1 (Section A)** are compulsory.
3. Attempt **any four** questions from **Section B**.
4. All questions in **Section B** carry equal marks.
5. Attempt **all** parts of a question together.

P.T.O.

SECTION A

1. (a) Give a one-word answer for the following: (4)

(i) Number of tuples in a relation

(ii) An entity that doesn't have a primary key of its own

(iii) Minimal superkey

(iv) An attribute that can take multiple values

(b) Consider the relation: (2)

Laptop (Model, clockFrequency, RAM, SSDCapacity, price) Find the degree of the relation. Are all the attributes of the relation Laptop atomic?

(c) Given relational schema **R(P, Q, R, S, T)** and the set of functional dependencies denoted by **FD = {P→QR, RS→T, Q→S, T→P}**. Show the steps to compute the closure of T (**T⁺**). (3)

(d) Consider the relation:

(i) $Q \rightarrow R$

(ii) $PQ \rightarrow S$

(iii) $PQ \rightarrow T$

7. (a) Consider a file having 20,000 STUDENT records of fixed length. Each record has the (5) following fields: ID# (7 bytes), name (25 bytes), address (50 bytes), dob (5 bytes) and course (12 bytes).). An additional byte is used as a deletion marker. This file is stored on a disk of block size B:512 bytes. Compute the following: (5)

(i) record length (R)

(ii) blocking factor (bfr)

(iii) number of file blocks (b)

(iv) number of block accesses required during binary search on the data

(b) Define four desirable properties of a Transaction that should be enforced by the Concurrency control? (4)

2261

14

(b) **SELECT SNO, STATUS****FROM Supplier****WHERE CITY = 'Delhi'****ORDER BY STATUS;**(c) **SELECT DISTINCT SNAME****FROM Supplier S, SupplyPart P****WHERE Quantity BETWEEN 100 AND 200
AND S.SNO=P.SNO;**

(c) Consider the relation:

(4)

P	Q	R	S	T
P1	Q1	50	S1	8
P2	Q2	30	S3	3
P3	Q3	50	S3	4
P1	Q1	50	S2	4
P1	Q3	50	S1	8

Which of the following functional dependencies does not hold for the above relation? Justify.

2261

3

X	Y	Z
x1	y1	z1
x2	y1	z1
x1	y1	z2
x2	y1	z3

(i) List two functional dependencies that this relation state satisfies.

(ii) Assume that the value of attribute **z** changes from **z3** to **z2**. Now list one functional dependency that this relation instance satisfies. (3)

(f) Decompose the table into 1NF:

Roll No	Name	City	Phone No
1	Subodh	Delhi	1111111111, 2222222222
2	Jitesh	Goa	3333333333
3	Sunil	Jaipur	4444444444, 5555555555
4	Piyush	Rohtak	7777777777

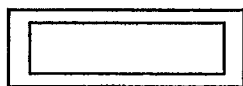
(3)

P.T.O.

2261

4

- (g) What do these symbols represent in an ER Diagram? (3)



- (h) Consider the following two relations, M and N:

M

X	Y	Z
5	3	6
10	7	9
15	2	7

N

P	Q	R
5	10	6
11	7	12
15	2	7

(3)

2261

13

4. Insert <10, 'Anu', 25, 'Patparganj'>

5. Insert <7, 'ajay', '25', 'Patparganj' >

- (b) Consider the supplier database (6)

Supplier

SNO	SNAME	STATUS	CITY
S1	Prentice Hall	30	Calcutta
S2	McGraw Hill	30	Mumbai
S3	Wiley	20	Chennai
S4	Pearson	40	Delhi
S5	Galgotia	10	Delhi

SupplyPart

SNO	PNO	Quantity
S1	P1	300
S1	P2	200
S2	P1	100
S2	P2	400
S3	P2	200
S4	P2	200

What is the output on the execution of following SQL queries?

- (a) **SELECT SNO FROM Supplier**

WHERE STATUS > 20 AND CITY LIKE 'C%';

P.T.O.

(iii) Change the city of the employee whose empName is 'Anil'.

(iv) Delete the record of all employees who live in Mumbai.

(v) Insert a new employee

('E009', 'XYZ', 'North', 'Delhi', 25000) (5)

6. (a) Consider the Relation PERSON (5)

PERSON ID	NAME	AGE	ADDRESS
1	Sanjay	35	Patel Nagar
2	Sharad	30	Mayur Vihar
3	Vibhu	36	North Campus

Check if any of the constraints gets violated, if the following operations are performed on the above tables. Consider each operation independent of others and justify your answers.

1. Insert <1, 'Vipin', 20, 'Mayur Vihar'>

2. Insert<'null' 'Anurag', 25, 'Patparganj'>

3. Insert<' abc', 'Suman', 25, 'IP college'>

The attributes X, Y, and Z of relation M are union-compatible with the attributes P, Q, and R of relation N, respectively. What will be the result of the relational algebra expressions:

$$(i) M \bowtie (M.X = N.P) N$$

$$(ii) M \cap N$$

$$(iii) M \cup N \quad (3)$$

(i) Consider a relation- R (V, W, X, Y, Z) with functional dependencies:

$$VW \rightarrow XY$$

$$Y \rightarrow V$$

$$WX \rightarrow YZ$$

Find three possible candidate keys. (3)

(j) Consider the following relational schema:

Employee (empNo, name, office, age)

Books (isbn, title, authors, publisher)

Issued (empNo, isbn, date)

Write an SQL query to perform the following operations:

- (a) Find the names of employees who have issued a book published by **CS_Press**.
- (b) Find the names of employees who have issued the maximum number of books.
- (c) Find the titles of books issued by employees whose name ends with the letter **'m'**. (6)

SECTION B

2. (a) Differentiate between Entity set and Entity type with the help of suitable example(s). (2)
- (b) Describe the three-schema architecture of database design with the help of a diagram. (3)
- (c) A Company maintains the following tables for its Database:

Map the ERD into relations. Specify the relations (tables) and identify the primary key and foreign key of each relation. (5)

5. (a) Consider a relation **R (A, B, C, D, E, F, G, H, I, J)** and the set of functional dependencies (10)

$F = \{ AB \rightarrow C, BD \rightarrow EF, AD \rightarrow GH, G \rightarrow I, H \rightarrow J \}$.

Find all possible candidate keys of **R**. Also, give an example of a super key of **R**.

Check whether **R** is in 2NF. If not, decompose the relation **R** into a set of 2NF relations. Check whether **R** is in 3NF. If not, Decompose the relation **R** into a set of 3NF relations. (5)

- (b) Consider the relation **Employee**:

Employee (empNo, empName, street, empCity, salary)

- (i) Rename the attribute **empNo** of the Employee table to **EID**.
- (ii) Add an attribute for the phone number.

Write SQL statements to perform the following:

- (i) To display the sum of the MARKS1 of all the students.
- (ii) To display the names of all the students who scored more than 50 marks in MARKS 2.
- (iii) Display record of all students whose total marks are greater than the total marks of the student whose name is 'AMAN'.
- (iv) Display total marks of the youngest student.
- (v) Using appropriate command, remove the column COUNTRY from STU_DETAILS.

(10)

- (b) Consider the following entity relationship diagram (ERD):

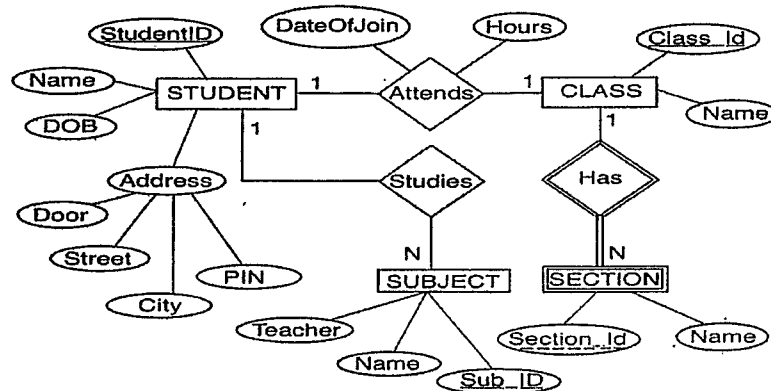


Table	Attributes
Executive	E_Id, Name, Address, Salary, Date_of_Joining,
Product	P_Id, Name, Price
Customer	C_Id, Name
Order	Invoice_No, Date_of_Purchase, P_Id, E_Id, C_Id, Quantity

Construct an ER diagram for the above database. An invoice is given by the executive. Each executive can write many invoices but each invoice is written by only one executive. The invoice is written for a single customer but each customer can have many invoices. Clearly specify cardinality ratios and participation constraints. State any assumptions that you make for drawing an ER diagram. (10)

3. (a) Suggest cardinality ratios of the given relationships based on common meaning. In each case, justify your answer.

Entity 1	Entity 2	Relationship name
Student	Course	Enrols
Player	Sports	Play
State	Chief Minister	Governs
Customer	Product	Purchases
Person	Mobile	Owns

(5)

2261

8

(b) Consider the following relation:

STUDENT_COURSE

Stud NO	CourseID	SNAME	PHONE	AGE	CourseName
1	C1	RAM	9716271721	20	DBMS
2	C2	JATIN	9898291281	19	HTML
3	C1	SUJIT	7898291981	18	DBMS
4	C3	SUMAN	9899307318	21	C++

Does the following operation result in any modification anomaly? Justify your answer. Insert into **STUDENT_COURSE**

values (4,'C4','Mohit', 9876546788,20,' CN')

(2)

(c) Write the relational algebra expression to perform the following operations on the relation schema given below:

2261

9

EMPLOYEE

Empno	ENAME	Address	Salary	Gender	Dno
-------	-------	---------	--------	--------	-----

DEPARTMENT

Dnum	DName	Manager
------	-------	---------

- (i) Retrieve the details of all employees who either work in department number 4 and earn at least 25,000, or work in department number 5 and earn at least 30,000.
- (ii) Retrieve the first name, last name, and salary of all employees who work in department number 5.
- (iii) Retrieve the names of managers for each department.
- (iv) Display the name and the address of female employees. (8)

4. (a) Consider the two relations given below:

STU_DETAILS (RNO, SNAME, DOB, ADDR1, ADDR2, CITY, COUNTRY) MARK_DETAILS (RNO, MARKS1, MARKS2, MARKS3, TOTAL)

P.T.O.

3529

12

```
for i in range(1, 21):  
    if i % 3 == 0:  
        print(f"Hello", end=' ')  
    elif i % 5 == 0:  
        print(f"Buddy", end=' ')  
    elif i % 15 == 0:  
        print(f"HelloBuddy", end=' ')  
    else:  
        print(i, end=' ')
```

(c) Create python functions, such as generate_squares
and generate_cubes to create : (5)

- (i) List A to store the squares of numbers
from 1 to 10.
- (ii) List B to store the cubes of numbers from
1 to 10.

(2000)

[This question paper contains 12 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 3529

I

Unique Paper Code : 2344001103

Name of the Paper : Programming using Python
(Ad. in 2024)

Name of the Course : B.Sc. (H) Computer Science
GE (NEP-UGCF-2022)

Semester : V

Duration : 3 Hours

Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. The paper has 2 sections. Section A is compulsory.
3. Attempt any four questions from Section B.
4. Parts of a question must be answered together.

P.T.O.

Section A

(Compulsory)

1. (i) Explain the difference between mutable and immutable data types in Python. Provide an example of each type and describe how they behave when modified. (3)
- (ii) Give the difference between add() and update() methods of python SET with an example? (3)
- (iii) Give the output of following code? (3)
 - (a) `print("Hello" * 3)`
 - (b) `print(sum([i for i in range(10) if i % 2 == 0]))`
- (iv) Write a python program using a function, such as `largst_element`, to find the largest element in a list. (3)

- (ii) If the % is between 45% and 59%, display "IInd Div".
- (iii) If the % is between 35% and 44%, display "IIIrd Div".
- (iv) If the % is less than 35%, display "Fail".

Ensure that the program uses proper if-else statements to determine the division based on the calculated percentage.

- (b) Explain in detail how exceptions are managed in python, with an example. (5)
 - (c) Write a python function, such as `calculate_factorial`, with a while loop to print the factorial of a number. (5)
7. (a) Explain the control statements supported by python, with suitable examples. (5)
 - (b) Convert the following for loop into while loop. (5)

(b) Write python code for a menu-driven program that prompts the user to enter two different numbers and then allows the user to choose an arithmetic operation (addition, subtraction, multiplication, or division) to perform based on the selected option. (5)

(c) Write a program to add N natural numbers and display their sum. (5)

6. (a) Write a python program to read the marks of 5 subjects through the keyboard. Calculate the aggregate and percentage of marks obtained by the student. Assuming the maximum marks that can be obtained in each subject are 100, the program should display the following based on the conditions : (5)

(i) If the % is greater than or equal to 60%, display "1st Div".

(v) Write the output of below code? (3)

```
a = [1, 2, 3]
```

```
b = [1, 2, 3]
```

```
print(a == b)
```

```
print(a is b)
```

(vi) What is the output of the code given below : (3)

```
def calculate_sum(a, b):
```

```
    return a + b
```

```
x = 5
```

```
y = 7
```

```
result = calculate_sum(x, y)
```

```
print(result)
```

(vii) Write a python program that accepts a list of integers and returns a new list containing only the even numbers from the original list. (3)

(viii) How to create a dictionary in Python? Give an example. (3)

(ix) Differentiate between append() and extend() methods with an example of each. (3)

(x) Write the output of the code given below: (3)

try:

```
a = [1, 2, 3]
```

```
print(a[5])
```

except IndexError:

```
print("Index out of range!")
```

finally:

```
print("Execution complete.")
```

(b) Evaluate the following expressions and justify your answers: (5)

(i) $7 * 2 - 5 ** 2 // 4 + 8$

(ii) $10 < 5$ or $7 < 12$ and not $18 > 3$

(iii) $\text{float}(6 - \text{int}(56.4) \% 2)$

(iv) $9 \& -11$

(v) $'\text{hello}' < '\text{hi}'$ or $'\text{I am fine}' > '\text{I am not fine}'$

(c) Write a python function is_palindrome(s) that checks if a given string is a palindrome, ignoring spaces, punctuation, and capitalization. (5)

5. (a) Define a python function called first_five_multiples that accepts a positive integer K and returns a list containing its first five multiples. For example, the first five multiples of 3 are 3, 6, 9, 12, and 15.

(5)

3529

8

(ii) def evaluate_expression_1(Z):

Z = Z + 5

def evaluate_expression_2(Z):

print("Hello")

return Z

return Z

value = 10

print(evaluate_expression_1(value))

(c) Write a python function, with appropriate comments, that takes name and age of a person as inputs and displays an appropriate message whether the person is eligible to vote or not. Minimum age for voting being 18 years. (5)

4. (a) Write a Python function calc_exp(base, exp) that computes the exponent of a number, i.e., calculates base^{exp} and the function should take two arguments. (5)

3529

5

Section B

2. (a) Consider the SET 'A' and SET 'B' (5)

A = {1, 2, 3}

B = {3, 4, 5}

Write the output of following :

(i) print (A | B)

(ii) print (A & B)

(iii) print (A - B)

(iv) print (A ^ B)

(v) print(B - A)

(b) Write a python program to display the Fibonacci sequence up to a specified number of terms. (5)

3529

6

- (c) Write a program using a function, such as `find_duplicates`, to display all duplicate items from the list (5)

Lst1 = [10, 20, 60, 30, 20, 40, 30, 60, 70, 80].

3. (a) Write a python program that performs the following operations on a tuple : (5)

- (i) Create a tuple with at least 6 elements.
- (ii) Access and print the third element of the tuple.
- (iii) Find and display the index of a specific element (choose any element from the tuple).
- (iv) Concatenate the tuple with another tuple containing 3 elements and display the result.

3529

7

- (v) Convert the tuple into a list, modify the list, and then convert it back into a tuple. Display the modified tuple.

- (b) Give the output of following codes : (5)

- (i) `def evaluate_expression_1():`

`global x`

`x = x - 5`

`def evaluate_expression_2():`

`global x`

`return x + 3`

`return evaluate_expression_2()`

`x = 10`

`print(evaluate_expression_1())`

3529

12

```
for i in range(1, 21):  
    if i % 3 == 0:  
        print(f"Hello", end=' ')  
    elif i % 5 == 0:  
        print(f"Buddy", end=' ')  
    elif i % 15 == 0:  
        print(f"HelloBuddy", end=' ')  
    else:  
        print(i, end=' ')
```

(c) Create python functions, such as generate_squares
and generate_cubes to create : (5)

- (i) List A to store the squares of numbers
from 1 to 10.
- (ii) List B to store the cubes of numbers from
1 to 10.

(2000)

[This question paper contains 12 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 3529

I

Unique Paper Code : 2344001103

Name of the Paper : Programming using Python
(Ad. in 2024)

Name of the Course : B.Sc. (H) Computer Science
GE (NEP-UGCF-2022)

Semester : V

Duration : 3 Hours

Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. The paper has 2 sections. Section A is compulsory.
3. Attempt any four questions from Section B.
4. Parts of a question must be answered together.

P.T.O.

Section A

(Compulsory)

1. (i) Explain the difference between mutable and immutable data types in Python. Provide an example of each type and describe how they behave when modified. (3)
- (ii) Give the difference between add() and update() methods of python SET with an example? (3)
- (iii) Give the output of following code? (3)
 - (a) `print("Hello" * 3)`
 - (b) `print(sum([i for i in range(10) if i % 2 == 0]))`
- (iv) Write a python program using a function, such as `largst_element`, to find the largest element in a list. (3)

- (ii) If the % is between 45% and 59%, display "IInd Div".
- (iii) If the % is between 35% and 44%, display "IIIrd Div".
- (iv) If the % is less than 35%, display "Fail".

Ensure that the program uses proper if-else statements to determine the division based on the calculated percentage.

- (b) Explain in detail how exceptions are managed in python, with an example. (5)
- (c) Write a python function, such as `calculate_factorial`, with a while loop to print the factorial of a number. (5)
7. (a) Explain the control statements supported by python, with suitable examples. (5)
- (b) Convert the following for loop into while loop. (5)

(b) Write python code for a menu-driven program that prompts the user to enter two different numbers and then allows the user to choose an arithmetic operation (addition, subtraction, multiplication, or division) to perform based on the selected option. (5)

(c) Write a program to add N natural numbers and display their sum. (5)

6. (a) Write a python program to read the marks of 5 subjects through the keyboard. Calculate the aggregate and percentage of marks obtained by the student. Assuming the maximum marks that can be obtained in each subject are 100, the program should display the following based on the conditions : (5)

(i) If the % is greater than or equal to 60%, display "1st Div".

(v) Write the output of below code? (3)

```
a = [1, 2, 3]
```

```
b = [1, 2, 3]
```

```
print(a == b)
```

```
print(a is b)
```

(vi) What is the output of the code given below : (3)

```
def calculate_sum(a, b):
```

```
    return a + b
```

```
x = 5
```

```
y = 7
```

```
result = calculate_sum(x, y)
```

```
print(result)
```

(vii) Write a python program that accepts a list of integers and returns a new list containing only the even numbers from the original list. (3)

(viii) How to create a dictionary in Python? Give an example. (3)

(ix) Differentiate between append() and extend() methods with an example of each. (3)

(x) Write the output of the code given below: (3)

try:

```
a = [1, 2, 3]
```

```
print(a[5])
```

except IndexError:

```
print("Index out of range!")
```

finally:

```
print("Execution complete.")
```

(b) Evaluate the following expressions and justify your answers: (5)

(i) $7 * 2 - 5 ** 2 // 4 + 8$

(ii) $10 < 5$ or $7 < 12$ and not $18 > 3$

(iii) $\text{float}(6 - \text{int}(56.4) \% 2)$

(iv) $9 \& -11$

(v) $'\text{hello}' < '\text{hi}'$ or $'\text{I am fine}' > '\text{I am not fine}'$

(c) Write a python function is_palindrome(s) that checks if a given string is a palindrome, ignoring spaces, punctuation, and capitalization. (5)

5. (a) Define a python function called first_five_multiples that accepts a positive integer K and returns a list containing its first five multiples. For example, the first five multiples of 3 are 3, 6, 9, 12, and 15.

(5)

3529

8

(ii) def evaluate_expression_1(Z):

Z = Z + 5

def evaluate_expression_2(Z):

print("Hello")

return Z

return Z

value = 10

print(evaluate_expression_1(value))

(c) Write a python function, with appropriate comments, that takes name and age of a person as inputs and displays an appropriate message whether the person is eligible to vote or not. Minimum age for voting being 18 years. (5)

4. (a) Write a Python function calc_exp(base, exp) that computes the exponent of a number, i.e., calculates base^{exp} and the function should take two arguments. (5)

3529

5

Section B

2. (a) Consider the SET 'A' and SET 'B' (5)

A = {1, 2, 3}

B = {3, 4, 5}

Write the output of following :

(i) print (A | B)

(ii) print (A & B)

(iii) print (A - B)

(iv) print (A ^ B)

(v) print(B - A)

(b) Write a python program to display the Fibonacci sequence up to a specified number of terms. (5)

3529

6

- (c) Write a program using a function, such as `find_duplicates`, to display all duplicate items from the list (5)

Lst1 = [10, 20, 60, 30, 20, 40, 30, 60, 70, 80].

3. (a) Write a python program that performs the following operations on a tuple : (5)

- (i) Create a tuple with at least 6 elements.
- (ii) Access and print the third element of the tuple.
- (iii) Find and display the index of a specific element (choose any element from the tuple).
- (iv) Concatenate the tuple with another tuple containing 3 elements and display the result.

3529

7

- (v) Convert the tuple into a list, modify the list, and then convert it back into a tuple. Display the modified tuple.

- (b) Give the output of following codes : (5)

- (i) `def evaluate_expression_1():`

`global x`

`x = x - 5`

`def evaluate_expression_2():`

`global x`

`return x + 3`

`return evaluate_expression_2()`

`x = 10`

`print(evaluate_expression_1())`

7. Write short notes on the following terms (any two):

(10)

- (i) Domain Name Server
- (ii) Crawling
- (iii) Browser Object Model
- (iv) Event Listeners

(500)

[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 5825 **I**

Unique Paper Code : 32341501

Name of the Paper : Internet Technologies

Name of the Course : **B.Sc.(H) Computer Science**

Semester : V

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll. No. on the top immediately on receipt of this question paper.
2. All parts of **Question 1 (Part A)** are compulsory.
3. Attempt any four questions from **Part B**.
4. All questions in Part B carry equal marks.

Part A

1. Answer the following questions:

- (a) Give two differences between cookies and sessions in the context of web development. (2)

P.T.O.

(b) What is meant by responsive web design? (2)

(c) What is the output of the following JavaScript Code?

```
<script type="text/javascript">
```

```
function x() {
```

```
document.write ("8"+15)
```

```
}
```

 (2)

(d) Explain the **serialize method** used in jQuery. (2)

(e) Give any two advantages of dynamic routing compared to static routing. (3)

(f) What is Network Address Translation (NAT), and how does it solve the issue of IP address depletion? (4)

(ii) Select the last **** element and change its background color to green.

(iii) Select all **** elements with the class attribute set to **hot** and add a new class called **cool** to them. (6)

(b) Write any two advantages and two drawbacks of using proxy servers. (4)

6. (a) Create a JSON object that represents information about a **Cricketer** with the following fields: **name**, **age** and **average-score**. Create an HTML button that triggers an AJAX request to fetch this JSON data from a server or a local file when clicked.

Provide the necessary JavaScript code to handle the onclick event and display the retrieved JSON data on the web page. (6)

(b) Write the important function of FTP protocol. What are the ports associated with it? (4)

- (b) Write the network address, broadcast address, valid host addresses and 4 subnet mask for the IP address: **122.161.50.253/30**. (4)
4. (a) Create a JavaScript object representing an **Employee** with properties like **name, department, and date of birth**. Implement a method within the object that calculates the **Employee's age**. Instantiate the object with sample data and display the **Employee's names, department, and age** on the webpage. (6)
- (b) What are the advantages of using Bootstrap? Discuss **any two** components of Bootstrap. (4)
5. (a) Create an HTML file containing a list of items using **** and multiple **** elements. Use jQuery to:
- (i) Select the first **** element and change its text color to blue and background color to red.

- (g) What is the difference between the operator "**=**" and "**==**"? Explain with the help of an example. (4)
- (h) Describe the following Networking Protocols with a suitable example:
- ping
 - tracert (4)
- (i) Why are **Class C** address blocks considered inadequate for meeting the infrastructure demands of medium to large-scale enterprise network architectures? Justify with an example to support this answer. (4)
- (j) Write a JavaScript code with the following validations for **username** and **password** fields:
- If the username or password field is not filled by values, an error message will appear

stating, **"You forgot one of the required fields. Try Again."**

- If the fields values entered do not match the hard-coded values, an error message will appear stating, **"Enter valid username and password."**

- If the values entered match, display the message: **"Welcome (username)".** (4)

- (k) What is a JSON object? Write the syntax to add a JSON object to define an employee with details such as **name, age, salary, designation, and mobile number.** (4)

Part B

2. (a) Why do we need AJAX in web applications? What are the steps taken by the browser to handle AJAX Requests and Responses? (6)

- (b) Write Node.js commands to connect to the MYSQL database with the name **"Customer_db"** and a table named **"Customer"** to print all the records of **Customer** whose **age** is above 40 and **salary** is more than 20,000. The fields of the **Customer** table are **CustId, Name, Age, and Salary.** (4)

3. (a) Differentiate between the following (any two): (6)

(i) Internet and Intranet

(ii) Blog and Forum

(iii) \$.post and \$.get

This question paper contains 4 printed pages]

Roll No.

--	--	--	--	--	--	--	--	--	--

S.No. of Question Paper : 7589

Unique Paper Code : 62347503

Name of the Paper : Programming in JAVA

Name of the Course : B.A. Programme

Semester : V

Duration : 3 Hours

Maximum Marks : 75

(Write your Roll No. on the top immediately on receipt of this question paper.)

The Paper has two sections. Section A is compulsory.

Attempt any *five* questions from Section B.

Parts of a question must be answered together.

SECTION-A

(Compulsory)

1. (a) Name a keyword that is used to inherit a class in Java. 1
- (b) Which package contains the **Scanner** class in Java ? 1
- (c) In Java, what does the **super** keyword do ? Write any *two* uses. 2
- (d) Define a method which converts an object to a string in Java. 2
- (e) How does garbage collection work in Java ? 2

P.T.O.

(f) What will be the output :

2

```
class Hello {
    public static void main(String[] args) {
        int a = 3, b = 5;
        System.out.println((a > b) ? a : b);
    }
}
```

(g) Write any *two* differences between `==` and `.equals ()` in Java.

2

(h) Why are strings immutable in Java ?

2

(i) Write the output of the following code :

2

```
class Hello {
    public static void main(String[] args) {
        int i = 1;
        System.out.println(i++ + ++i);
    }
}
```

(j) Differentiate **break** and **continue** statement in a loop. Explain with the help of an example.

3

(k) Define the term **destructor** in Java. Write any *two* advantages of using **destructor** in Java.

3

(l) Find the output of the following Java code :

3

```
class HelloWorld {
```

```
public static void main(String[] args) {  
    int i = 0;  
    while (i < 5) {  
        System.out.print(i + " a");  
        i++;  
    }  
    System.out.println(i);  
}
```

SECTION-B

(Attempt any five)

2. (a) What is encapsulation in Java ? Explain how encapsulation is implemented in Java with an example. 5
- (b) Write a Java program to print the following pattern : 5

```
*  
* *  
* * *  
* * * *  
* * * * *
```

3. (a) Explain with an example how constructor overloading works in Java. What are the rules for overloading a method in Java ? 5
- (b) List the main access modifiers in Java and explain the level of access they provide. 5

4. (a) What are the differences between single inheritance and multilevel inheritance ? Provide examples. 5
(b) Describe method overriding, and how does it demonstrate runtime polymorphism in Java. 5
5. (a) Write a Java program to reverse a string without using the built-in function of reversing a string. 5
(b) What is the purpose of methods in Java ? Explain the difference between a method with parameters and a method without parameters. 5
6. (a) Explain the concept of dynamic binding in Java. Give an example in support of your answer. 5
(b) How do abstract classes support the concept of inheritance in Java ? Provide a practical example. 5
7. (a) Write a Java program to calculate the perimeter of a circle and triangle using method overriding. 5
(b). What are the basic operations that can be performed on arrays in Java ? Explain how to declare, initialize, and access array elements. 5
8. Write short notes on any of the *four* below : 10
 - (i) Abstract methods
 - (ii) Final classes
 - (iii) Command line argument
 - (iv) Accessibility modifier
 - (v) Static methods.

This question paper contains 7 printed pages]

Roll No.

--	--	--	--	--	--	--	--	--	--

S. No. of Question Paper : 7588

Unique Paper Code : 62347502

Name of the Paper : Programming with Python

Name of the Course : B.A. Programme (CBCS-LOCF)

Semester : V (Year of admission 2019 onwards)

Duration : 3 Hours

Maximum Marks : 75

(Write your Roll No. on the top immediately on receipt of this question paper.)

Section A is compulsory.

Attempt any five questions from Section B.

All parts of a question must be answered together.

Section-A

1. (a) Which Python library have to be imported to use the following functions : 2
 - (i) `sin()`
 - (ii) `randint()`
- (b) Give the step-by-step execution of the following expression : 2
$$6+5/4**2$$
- (c) Find the output of the following : 2

```
def textchanger (text):  
    n = len (text)  
    ntext = ''  
    for i in range (0, n):
```

P.T.O.

```

if text(i).isupper():
    ntext = ntext + text[i].lower()
elif text [i].isalpha():
    ntext = ntext + text[i].upper()
else:
    ntext = ntext + 'bb'
print (ntext) ,
textchanger(Com@)

```

(d) What is the output of the following code :

2

```

line = [4, 9, 12, 6, 20]
for i in line:
    if i%3 == 0:
        print(i)
print( )

```

(e) Write a Python function that accepts two numbers and returns the smaller number of the two numbers.

3

(f) Identify invalid identifiers and give reasons.

3

(i) #ofElements

(ii) No of elements

(iii) 3elements

(iv) noOfElements

(v) d145

(vi) if

- (g) Rewrite the following Python code using while loop :

3

```
sum=0
for i in range (1, 7, 2):
    sum+=i
```

- (h) What do you understand by local and global scope of variables ? How can a global variable be updated inside a function.

4

- (i) Rewrite the following code in python after removing all syntax error(s).

4

Underline each correction done in the code.

```
to =30
for k in rang (0, to)
    IF k%4==0:
        print(k*4)
    else
        print(k*3)
```

Section B

2. (a) Write a python function that takes an integer 'n' as input and calculates the sum of series given below :

6

$1 + 1/1! + 1/2! + 1/3! + \dots + 1/n!$

- (b) Give the output that will be produced on execution of the following code segment :

4

```
a = 12          # 12 in binary : 00001100
b = 10          # 13 in binary : 00001001
i. b = a & b
   print(b)
ii. a = a | b
   print(a)
```

P.T.O.

3. (a) Given a recursive function below :

5

```
def sum(n):
    if (n==1):
        return(0)
    else:
        return(n+sum(n-1))
```

Explain the step-by-step execution of the function call `sum(5)`. What will be the output of `sum(5)` ?

- (b) Write a nested `if` statement in Python to calculate the commission depending on sales as given below :

5

```
sales <= 10,000 then commission = 25% of sales
sales < 10,000 and sales >= 7,000 then commission = 20% of sales
sales < 7,000 and ..... >= 5,000 then commission = 15% of sales
sales < 5,000 and ..... >= 2,000 then commission = 10% of sales
sales < 2,000 then commission = 5% of sales
```

4. (a) Differentiate between List and Tuple using appropriate example. Write a program to enter two tuples `t1`, `t2` and perform its concatenation in tuple `t3` as follows :

5

```
t1=(78, 99, 11), t2=(10,20), t3=(78,99,11,10,20)
```

- (b) Consider sets : `s = set (['a', 'b', 'c', 'd', 'e'])`

```
v = set (['x', 'y', 'z'])
```

5

Write Python statement to perform following operations :

- (i) Union of sets s and v
- (ii) Intersection of sets s and v
- (iii) Difference of sets s and v
- (iv) Check whether 'c' is present in set v .
- (v) Check whether sets s and v are same or not.

5. (a) Write a function for linear search that accepts two arguments : a list of numbers and a number to be searched and returns whether the element is present or not. 5

For example, if the list is [68, 24, 78, 60, 24, 14] and 78 is to be searched then the function should return 'Element found'.

- (b) Given the tuple : $t1 = (12, 5, 2, 4, 17, 6, 9, 10)$. Write Python statements to : 5

- (i) Print first half of the values of $t1$ in one line and the other half in another line.
- (ii) Concatenate a tuple $t2 = (11, 13, 15)$ with $t1$.
- (iii) Return maximum and minimum value from $t1$.
- (iv) Extract elements from index 2 to 4.
- (v) Find the index of element 4 in $t1$.

6. (a) Write a program to create a dictionary `city_state` having *key:value* pairs : 6

`{city:state}`. Define appropriate functions to add and remove *key:value* pairs from the dictionary `city_state`.

- (b) Let string `str1="Examination2024"`, write Python statements to perform the following : 4

- (i) Count the number of occurrences of "a"

- (ii) Check whether `str1` is alphanumeric.
- (iii) Check whether `str1` has a suffix 2024.
- (iv) Replace "i" with "u".

7. Define a Python class `BankAccount` that keeps track of a bank's customers having the following data members : 10

`name` : Name of the customer

`accountNum`: Account Number

`balance`: Balance in the Bank account.

The class should support the following functions :

- `Deposit` function for depositing money in the account
- `Withdraw` function for withdrawing money from the account
- `_str_` function to display the complete details of an object of the `BankAccount`.
- `print_balance` function displays the current balance.
- `findInterest` function to determine the interest on the basis of balance in the account and the interest rate applicable as per the table listed below :

Amount Rate of Interest (%)	Rete of Interest (%)
$\geq 3,00,000$	7
$\geq 1,00,000$ and $< 3,00,000$	5
$< 1,00,000$	3

Write statements to :

- Create an account for customer ABC having a balance of Rs. 2,50,000.
- ABC keeps this money with the bank for a year. Calculate the interest for ABC. Also, after end of 1st year, the customer deposits the same amount in the account. Display the updated balance of the account.
- ABC withdraws Rs. 1,00,000 from the account. Display the updated balance of the account.

SL NO of QP : 6230A

Unique Paper Code : 42343503
Name of the Course : B. Sc. Programme (CBCS-LOCF) SEC
Name of the Paper : Web Design using HTML5
Semester : V
Duration : 2 Hours
Maximum Marks : 25

Instructions for the candidates

1. Write your roll number at the top of this question paper immediately.
2. Question 1 from **Section A** is **compulsory**.
3. Attempt any **3 questions** from **Section B**.
4. Answer all parts of a question together.

Section A

Q1. a) Define the following attributes used in a table:

- i. Cell Padding (2)
- ii. Cell Spacing

b) What is the output of the code given below: (2)

```
<html>
<head>
<title>www.list.com</title>
<body>
<ol>
  <li>Java</li>
  <li>Visual Basic</li>
  <li>BASIC</li>
  <li>COBOL</li>
</ol>
</body>
</html>
```

c) Write any two ways the color property values can be specified in CSS? (2)

d) Write the HTML code to print the following equation: (2)
$$\text{PCL}_3 + \text{CL}_2 = \text{PCL}_5$$

e) Explain the usage of fieldset tag with the help of an example. (2)

f) What does the property margin: 40px 100px 120px 80px in CSS signify? (2)

Section B

Q2.(a) What are the three main ways to add CSS to a webpage? (3)

(b) Differentiate between internal linking and external linking in a web page. (2)

Q3.(a) Write the HTML code to design a form for a school website including the following elements: (3)

- i. A textbox to enter the name of a student with maximum length 30.
- ii. Roll No as a numeric field with autofocus as the form opens.
- iii. A drop-down list to select the class.
- iv. A submit button.
- v. All the fields are compulsory.
- vi. A clear button to clear all the above entries made by a user.

(b) Write a CSS code to change the following properties: (2)

- i. H1 heading to "center" align.
- ii. H3 text indentation to 5 cm.

Q4.(a) Differentiate between frame and frameset tags with an example. (3)

(b) What do you understand by the CSS box model. Write the code to make the following changes in the box model: (2)

- i. Padding: 50px
- ii. Border: Solid Blue
- iii. Left Margin: 3 cm
- iv. Width: 320px

Q5.(a) Differentiate between transparency and reflections with respect to special effects in CSS. (3)

(b) Write the HTML code to insert an image and use the alt attribute to define the image. (2)

Q6.(a) Create an html page with the following specifications: (3)

- i. The title of the web page should be "ABC College".
- ii. Put an image in the background.
- iii. Place the College name as the heading of the page followed by address as the sub heading.

(b) Which HTML tag is used to create a navigation bar? Give example. (2)