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May - 2024
[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 4008

H

Unique Paper Code : 2342571201

Name of the Paper : Data Structure

Name of the Course : B.Sc. (Programme) and
B.A. (Programme)

Semester : II

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. Section A is compulsory.
3. Answer any **four** questions from **Section B**.
4. All parts of Question must be attempted together.

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SECTION A

1. (a) Explain any two Abstract Data Types in C++. (3)
- (b) What will be the output of the following operations on an empty Stack. (3)
Push(3), Push(4), Pop(), Push(5), Push(6), Pop()
- (c) Write C++ code to add an element into a Queue. (3)
- (d) Define Deque and explain any two operations that can be performed on it. (3)
- (e) Write C++ code to read and write an array of n-dimension. (3)
- (f) Differentiate between the following with a suitable example :

- (i) BFS and DFS tree traversal

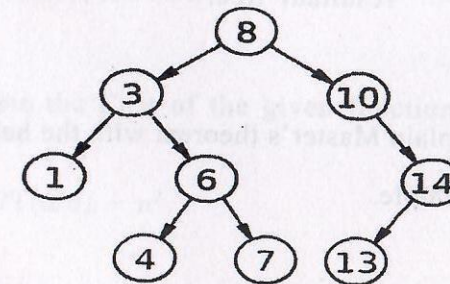
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- (ii) Complete and Perfect Binary tree (6)
- (g) Define Height Balanced trees with a suitable example. (3)
- (h) How to convert a singly link list into a circular link list? Explain. (3)
- (i) What do you mean by asymptotic Big-O analysis of an algorithm? (3)

SECTION B

2. Consider the following BST (15)



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Show the status of BST after each of the following operations :-

- (i) Draw the updated tree after 2 will be inserted in the BST.
- (ii) Draw the updated tree after deleting 3 from the BST.
- (iii) Write post-order traversal of the resultant BST.
- (iv) Check if the resultant tree is height balanced or not? Justify your answer.
- (v) Write pre-order traversal of the Final resultant tree.

3. (a) Explain Master's theorem with the help of suitable example. (6)

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- (b) Write a program in C++ to find n^{th} Fibonacci Series using recursive function. (5)

- (c) Write a program in C++ to find factorial of a number 'n'. (4)

4. (a) Write a program in C++ to implement stack using Linked List. (6)

- (b) Draw a tree whose in-order and post-post traversals are given below : (5)

In-order: BFEADGC

Post-order: FEBGDCA

- (c) Evaluate the Cost of the given function:- (4)

$$T(n) = 7T(n/6) + n^2$$

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5. (a) Differentiate between Singly and Doubly Linked list. Also, write a program in C++ to insert an element in the beginning of a singly linked list. (6)
- (b) Write C++ code to delete a node from the end of a singly linked list. (5)
- (c) Mention any two advantages and disadvantages of Linked list. (4)
6. (a) Create a BST with the following values {7,5,1,8,3,6,0,9,4,2} if the numbers are inserted in the order as given into an initially empty BST. Also, write its in- order traversal. (6)
- (b) Draw a Recursion tree for the recurrence
- $$T(n) = 3T\left(\frac{n}{4}\right) + cn^2. \quad (5)$$

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- (c) Write any two real-life applications each of stack and queue. (4)
7. (a) Consider the following sequence of operations performed on an initially empty doubly linked list : (6)
- InsertBeginning(12),
 - InsertBeginning(4),
 - InsertEnd(3),
 - InsertEnd(1),
 - DeleteBeginning(),
 - Deletenode(1)
- Show the contents of the list, links between the nodes, and head and tail after each operation.
- (b) Perform and explain count sort on the array {5,5,7,6,7,4,3} (5)

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(c) Mention any two properties of a Binary Heap.

(4)

(1500)

[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1096

H

Unique Paper Code : 32345402

Name of the Paper : Information Security &
Cyber Laws

Name of the Course : Computer Science: Generic
Elective for Honours

Semester : IV

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. The paper has **two** sections.
3. **Section A** is compulsory.
4. Attempt any **four** questions from **Section B**.
5. Part of a question must be answered together.

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SECTION A

1. (a) Define Cryptanalysis, Cryptography and cryptology. (3)
- (b) What are the three goals of data security? (3)
- (c) List four guidelines for password selection. (4)
- (d) What do you understand by plaintext and ciphertext in encryption? Who will use them and how while communicating? Demonstrate using a diagram. (4)
- (e) What is an internal threat? How is it different from external threat? Give example. (4)
- (f) Given the following plaintext and ciphertext, identify along with justification whether a

substitution cipher is used or a transposition cipher for encrypting the text : (4)

(i) Plaintext – HOW ARE YOU

Ciphertext – JQY CTG AQW

(ii) Plaintext – HOW ARE YOU

Ciphertext – HWRYUOAEQ

- (g) What is passive attack? For securing a computer system from passive attacks, which method would you prefer prevention or detection? Give reason. (4)
- (h) (i) Which attack uses IP packets to 'ping' a target system with an IP size over the maximum of 65,535 bytes?

(ii) Name a type of malicious software that is appended to an application and is triggered by a specific occurrence, such as a logical condition or a specific date and time.

(iii) Name the attack by which an attacker executes malicious SQL queries on the backend database by manipulating the input to the application. (3)

(i) Define digital signatures under the provision of the IT Act 2008 with an example. (2)

(j) What do you mean by risk management? Explain the three strategy for dealing with the risk. (4)

SECTION B

2. (a) Describe at least two ways of breaking a Caesar cipher on an English-language message. Encrypt the message "I AM A STUDENT OF UNIVERSITY OF DELHI" using Caesar cipher with key size 5. (5)

(b) Encrypt the message "I AM A STUDENT OF UNIVERSITY OF DELHI" using Rail fence technique by using 3 rails. (5)

3. (a) Who is a hacker? Define various types of hackers. (6)

(b) What are DoS Attacks? Explain any two types of DoS attacks. (4)

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4. Write short notes on the following :

(10)

(a) Authentication

(b) One Time passwords

(c) Program Threats

(d) System Threats

(e) Computer Security Classifications

5. (a) Describe section 66B, 66C and 66F of IT ACT 2008. Explain the penal provisions for the same.

(6)

(b) What is the difference between public key encryption and private key encryption?

(4)

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6. (a) What do you mean by IDS? How is it different from firewall? Differentiate signature based IDS and anomaly based IDS.

(6)

(b) What is the name of first super computer of India? Where it was developed? Explain National Supercomputing Mission.

(4)

7. (a) Explain the difference between packet filters and application layer proxy firewalls. Can a stateless firewall block TCP connection initiation requests from an external location to any local host?

(6)

(b) Describe any two types of software attacks.

(4)

8. Briefly explain the following :

(10)

(a) DIGILOCKER

P.T.O

(b) MEGHRAJ

(c) Government E-Marketplace

(d) IHIP

(e) Mobile Seva App Store

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[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 3317

H

Unique Paper Code : 42343409

Name of the Paper : Programming in C++

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

Semester : IV

Duration : 2 Hours

Maximum Marks : 25

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Parts of the question must be answered together.
3. Marks are indicated against each question.

SECTION A

1. (5×2=10)
(a) What is Polymorphism in OOP?
(b) Create a class Box in C++ having three data members: Length, Width and Height.

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(c) Rewrite the following code using while loop:

```
for (int i = 1; i <= 10; i++)
    cout << i;
```

(d) Write output of the following code :

```
int array[ ] = {0,2,4,6,7,5,3};
int n, result = 0;
for (n = 0; n < 8; n++)
    result += array[n];
count << result;
```

(e) Write a C++ loop to display all perfect squares till 100.

It should display : (1, 4, 9, 16, 25, 36, 49, 64, 81, 100).

SECTION B

Attempt any **three** questions : (5×3)

2. (a) Write a function power that accepts two integers x and y as arguments and returns y^{th} power of x that is x^y . (3)

(b) Define the function main() that calls the above function and displays results for the following values : x = 3, y = 4. (2)

3. (a) Which of the following is a valid function declaration? Justify your answer. (3)

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(i) int fl(int i = 1, int j = 2, int k);

(ii) int fl(int i = 1, int j, int k = 2);

(iii) int fl(int i, int j = 2, int k = 3);

(b) What are inline functions? When will you make a function inline? (2)

4. (a) (i) Create a 2-dimensional character array initialized with all days of a week.

(ii) Create a variable that holds an integer value that may never be changed. (3)

(b) Give the output of the following code, justify your answer : (2)

```
// Assume that integers take 4 bytes.
```

```
#include<iostream>
```

```
using namespace std;
```

```
class Test
```

```
{
```

```
    static int i;
```

```
    int j;
```

```
};
```

```
int main()
```

```
{
```

```
    cout << sizeof(Test);
```

```
    return 0;
```

```
}
```

5. (a) What is the sequence of constructors and destructors being called in the following multilevel inheritance : (3)

```
class A
{...};
class B: public A
{...};
class C: public B
{...};
class D: public C
{...};
```

- (b) What is function overloading? Give examples. (2)

6. (a) Find the errors in the following code segments : (3)

```
(i) int func (int x, y)
{
    int z;
    Count << z;
}
```

```
(ii) class du
{
    Private :
    ... ;
    Public :
        Void ~ du (void);
}
```

- (b) Write an example class containing one data member and one member function. (2)

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[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 4003

H

Unique Paper Code : 2342572401

Name of the Paper : Operating Systems

Name of the Course : **B.Sc. (Multidisciplinary
Courses of Study with
Three Core Disciplines
under UGCF 2022)**

Semester : IV

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. **Section A** is Compulsory.
3. Answer any **four** Questions from **Section B**.
4. Parts of a question must be answered together.

P.T.O.

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Section A

1. (a) Mention names of any two mass storage devices. (1)
- (b) Differentiate between mv and cp commands in Unix/Linux. (2)
- (c) List two main functions of the Operating System. (2)
- (d) What is a thread? What are the benefits of using threads in a programming environment? (1+1)
- (e) What is a two-level directory structure? (2)
- (f) What is the difference between logical and physical address? (2)
- (g) What is dual mode of operation in the context of an Operating system? (3)
- (h) Give an example for absolute path and relative path in a directory? (3)
- (i) Briefly describe the working of Shortest Remaining Time First scheduling algorithm. (3)

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- (j) What is meant by the term 'virtual address space' of a process? (2)
- (k) List two system calls for each of the following : (2+2)
 - (i) Process control
 - (ii) Device management.
- (l) What is a Process Control Block (PCB)? Elaborate the information stored in it. (1+3)

Section B

2. (a) In a multiprogramming uniprocessor system, how many processes can be in running state and how many processes can be in ready state at a particular time? (2)
- (b) What is the challenge faced by the designers of Operating System while implementing Shortest Job First scheduling algorithm? (2)
- (c) A process goes through various states from its creation to termination. Illustrate the states of a process using a diagram and explain briefly the different states. (3+2)

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- (d) The following processes arrive in order P1, P2, P3, P4, P5 at time 0. Draw Gantt chart showing the execution of these processes using SJF (Shortest Job First). Calculate the average turnaround time and average wait time. (3+3)

Process	Burst Time
P1	3
P2	2
P3	7
P4	4
P5	5

3. (a) What is the Unix Kernel? (2)
- (b) What is the purpose of pipes in shell script? Give an example. (1+1)
- (c) Write a shell script to input a number N and print all the prime numbers between 1 and N. The program should be well documented. (5)

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- (d) A file named abc.txt contains following data

(3×2)

Amit
Bharat
Sanjeev
Sanjay
Dhanraj
Inderjit
Sankalp

What is the output of the following commands:

- (i) `grep [s] abc.txt`
- (ii) `grep san [^j] cut -c 3,5 abc.txt`
4. (a) Give Unix/Linux commands to remove a file and remove a directory. (2)
- (b) Give the advantage of layered design of the Operating System (2)

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- (c) What is an Application Programming Interface (API), what are the advantages of a programming environment which uses API. (1+1)
- (d) Explain the difference between system call and system program. (2)
- (e) Each system call will require passing some parameter(s) to the Operating System. What are the three parameter passing techniques? (3)
- (f) List any 4 categories of system programs. (4)
5. (a) What is the purpose of a page table in memory management? (1)
- (b) A memory has a page size of 1 KB. determine the page number and offset for the following addresses (3×2)
- (i) 3085
 - (ii) 4205
 - (iii) 65000

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- (c) Given memory partition sizes of 200KB, 600KB, 100KB, 300KB and 450 KB. How would the processes of sizes 330KB, 250KB, 500KB and 350 KB be placed in the memory for first fit, best fit and worst fit algorithms. Calculate internal and external fragmentation in all three algorithms. (3×2+2)
6. (a) For a paging environment in the main memory, the logical address has two parts - page number and offset. The size of the page frame is 2K. What should be the size of the offset (in bits)? (3)
- (b) What is preemptive and non-preemptive process scheduling? Name two algorithms for each and justify your categorization into preemptive and non-preemptive. (2+4)
- (c) What are the three methods to access data in a file? Give comparison in terms of efficiency and ease of implementation. (6)
7. (a) Draw a labelled diagram showing structure of a magnetic disk. (4)

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(b) What is demand paging? What is Page fault? What are the steps to handle page fault? (1+1+3)

(c) What is transfer rate, seek time and rotational latency in a disk? A disk has average seek time of 12ms and spins at 7200 RPM (revolutions per minute). Data transfer rate for the disk is 4MB/sec. Calculate the time required to transfer 8KB data to the disk. Assume there are no other time overheads/delays. (3+3)

(1500)

[This question paper contains 12 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 5832

H

Unique Paper Code : 2344002004

Name of the Paper : Introduction to Web
Programming

Name of the Course : **Computer Science Generic
Elective**

Semester : IV

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. This question paper has **two** sections **A** and **B**.
3. Question **1** in **Section A** is compulsory.
4. Attempt any **4** questions from **Section B**.
5. Parts of a question must be attempted together.
6. **Section A** carries **30** marks and each question in **Section B** carries **15** marks.

P.T.O.

Section-A

1. (a) What is meant by tags? Give two examples of formatting tags. (2)
- (b) Differentiate between Internet and Extranet. (2)
- (c) Write a jQuery statement to change the font style of a paragraph to 'monospace' and to align the text to 'justify'. (2)
- (d) Write a HTML code to create a link that has a color 'blue' but color is changed to 'Green' when link is visited. (3)
- (e) Explain the box-model in CSS with the help of a diagram. Name the attributes of CSS applicable for box-model. (4)
- (f) List any four key points that should be considered while planning a website. (4)

- (g) Write HTML and CSS code to set alignment "right" and the text color "cyan" and border color "red" of a paragraph using class and id properties. (4)
- (h) Write the HTML code to create the table given below : (4)

	Average		Total
	Theory	Practical	
	70	30	
Boys	52	25	77
Girls	60	27	87

- (i) Give the output of the following code segment: (5)

```
<script>
var x= 12.5;
var y = '4';
document.write('<br> parseInt(3.2)= ' + parseInt(3.2));
document.write('<br> parseFloat(7)= ' + parseFloat(7));
document.write("&<br> 5 == '5'" + (5 == '5'));
document.write("&<br> 5 === '5'" + (5 === '5'));
document.write('<br> x + y = ' + (x + y));
</script>
```

SECTION-B

2. (a) What are three ways to add CSS code in HTML document? What is the precedence of these three types of CSS? (5)

- (b) Write an html code to create a division with 'yellow' background color and a button with the text 'Change Color' on it. Use jQuery to define the function on the click of the button, that selects the division and changes its background color to 'pink'. (5)

- (c) Write the syntax to perform the following : (5)

- To insert a hyperlink to email address.
- To style the font-style and font size of elements with id "demo" using CSS.

- To set the margin and border of a division, an image and a span element simultaneously, using CSS without using class.
3. (a) Create an html file 'signup.html' to create an account registration form for a mail-server, having the following fields: (5).

- Two Text boxes for: user-ID and password.
- Checkboxes for Gender.
- Submit (Labelled as 'Register') and Reset buttons. Use label tags to label the elements. Also, when the form gets submitted, a 'success.html' page must be presented to user with message "Registration successful".

(b) Create another file "form.css" to style the form elements mentioned in Q3 (a): (5)

- Set the width of textbox to 60px.
- Set the Font size of labels to 12px, font style to 'Verdana'.
- Set 20px Padding for textboxes.
- Apply 2px thick border of 'aqua' color around the form.

Also, write the HTML statement to link CSS file "form.css" with the HTML file "signup.html".

(c) What are semantic tags in HTML? Describe any three semantic tags with suitable examples.

(5)

4. (a) Create an HTML file having a textbox to accept a number. Write the JavaScript function that executes when the textbox loses focus and performs the following : (5)

- Access the number entered by the user in the textbox and stores in a variable named 'num'.
- Checks if the number is less than zero or not. It displays the message "The entered number is negative" if $\text{num} < 0$, else displays the message "The entered number is positive" in the alert box.

(b) Differentiate between break and continue statements in java-script. Give suitable examples of break and continue. (5)

(c) Differentiate between implicit and explicit typecasting in JavaScript. Write the output of the following code. Also briefly explain where the implicit or explicit typecasting is being performed. (5)

```

<script>
    var x = 5;
    var y = '4';
    var z = (7.52).toString();
    document.write('<br> x + y = ' + (x+y));
    document.write('<br> x * y = ' + (x*y));
    document.write('<br> x + z = ' + (x+z));
</script>

```

5. (a) Give a brief description of any two formats of images that are supported by HTML5. Write an HTML code to insert an image in the document. (5)

- (b) Write a Javascript code to display multiplication table of a number entered by the user through prompt. (5)

- (c) Give the syntax to perform the following : (5)

- Add comments in HTML.
- Create hyperlink on an image.
- Create a marquee running from right to left and from left to right alternatively.
- To make specific word/phrase in a sentence relatively bigger than rest of the text.

For example 'The world is very small'.

- To write the chemical equation ' $2\text{H}_2\text{O} = 2\text{H}_2 + \text{O}_2$ '.

- 6 (a) Write the HTML code to define following HTML elements having the id and class as mentioned below: (10)

- One <HR> element.

- Two paragraph elements having different classes, namely "class-A" & "class-B",
- Three divisions - div-1 having id = "div1" and div-2 and div-3 having classes as "class-A" and "class-B", respectively.

Use internal CSS to style above elements to demonstrate the usage of :

- Element-selector to style the <HR>,
- id-selector,
- Class-selector,
- Selection of the multiple HTML elements to be styled in same way.

- (b) Create an HTML document with two textboxes. Write the jQuery code such that when a textbox gets the focus, its background color must change to 'yellow', and when it loses focus, its background color is removed.

(5)

7. (a) What is a website-address? Describe various components of a web-address giving suitable example. (4)

- (b) Write the HTML code to create the following list structure : (5)

o Social Media Platforms

I. Facebook

II. Twitter

III. Instagram

IV. WhatsApp

o OTT Platforms

I. NetFlix

■ Series

■ Documentary

■ Movies

II. Prime Video

III. HotStar

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(c) What is meant by a Sitemap? Describe the hierarchical and linear website-structure with the help of suitable diagram. (6)

(1500)

```
(iv) obj1 = pd.Series(['X', 'Y', 'Z', 'A', 'B'],  
index=['one', 'two', 'three', 'six', 'five'])  
print(obj1)  
print(obj1['three':'five'])
```

```
(v) df=pd.DataFrame([[1, 2, 1], [3, 1, 1], [4, 2, 0],  
[1, 2, 3]], index = ['x1', 'x2', 'x3', 'x4'],  
columns = pd.Index(['P', 'Q', 'R'], name = 'Plot'))  
df.plot.bar()
```

[This question paper contains 16 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 4270 **H**

Unique Paper Code : 2343012009

Name of the Paper : Data Exploration and
Visualization

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

Year of Admission : 2022

Semester : IV

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. **Section A** is compulsory.
3. Attempt any **four** questions from **Section B**.
4. All the parts of a question must be answered together.
5. Assume that numpy has been imported as np and pandas has been imported as pd.

Section A

1. (a) What will be the output produced on the execution of the following code? (2)

```
narr = np.array([-4.6, 8.2, 14.5, 56.9, 29.4, -72.7])
narr1 = narr.astype(np.int32)
print(narr1)
```

- (b) Consider a DataFrame df1 with a column EmpId. Write a Python statement to remove rows containing duplicate EmpId values from df1 and keep only the last observed value combination.

(2)

- (c) (i) Plot the graph generated by the code below : (2)

```
import matplotlib.pyplot as plt
plt.plot([5, 4, 3, 2])
```

- (ii) Show the change in plot, if any, when the code is modified to

```
plt.plot([5, 4, 3, 2], '*b')
```

- (d) Write a code in Python using the plotly express library to draw a line graph for the function $y = \sin(x)$ for x in the range 0 to π (pi). (3)

```
company_names = ['Tesla', 'Apple', 'Google', 'Amazon']
```

```
share_price = [25, 25, 40, 10]
```

Write a code in Python using the plotlygraph_objects module to plot a pie-chart with company prices as labels and share prices as values.

- (b) What will be the output produced on the execution of the following code? (10)

```
(i) a = np.arange(16).reshape(4, 4)
    print(a)
    a[(a > 7)] = -1
    print(a)
```

```
(ii) x = np.array([[4, 3], [2, 1]])
     y = np.zeros_like(x)
     print(y)
     z = np.eye(4) * x
     print(z)
```

```
(iii) obj = pd.Series(['blue', 'purple', 'yellow'],
                      index=[0, 2, 4])
      print(obj)
      obj.reindex(range(6), method='ffill')
      print(obj)
```

- (b) Consider the file data.csv with the following contents : (8)

1, 2, 3, 4, hello

5, 6, 7, 8, world

9, 10, 11, 12, foo

- (i) Write a Python statement to read the above file into a DataFrame data with the last column (hello, world, and foo) constituting the index.

- (ii) List the contents of DataFrame data.

- (iii) Write a Python statement to store the DataFrame data in the file updated_data.csv using colon (:) as the separator.

- (iv) List the contents of the text file updated_data.csv created in the previous step.

7. (a) Consider the lists containing names of some tech companies and their share prices given below as Python lists : (5)

- (e) Given the following arrays: (4)

```
arr_x = np.array([[3, 5, 7], [2, 4, 6]])
```

```
arr_y = np.array([[1, 2, 3], [4, 5, 6]])
```

What will be the output produced on the execution of the following statements?

- (i) arr_x.dtype

- (ii) arr_y - arr_x

- (iii) 1/arr_y

- (iv) arr_x > arr_y

- (f) What are the following functions used for? Illustrate with suitable examples. (4)

- (i) reindex()

- (ii) arange()

- (g) Differentiate between the use of the following Python functions/data structures with the help of suitable examples. (4)

- (i) np.random.rand and np.random.randn

- (ii) Series and DataFrames

(h) (4)

```
data = pd.DataFrame({
    'Dept': ['X', 'X', 'Y', 'Y', 'X'],
    'Age': [19, 21, 23, 21, 20],
    'Category': ['I', 'II', 'I', 'II', 'I'],
    'Salary': [1800, 2100, 2000, 2200, 1100]
})
```

For the DataFrame df given above, write Python statements to :

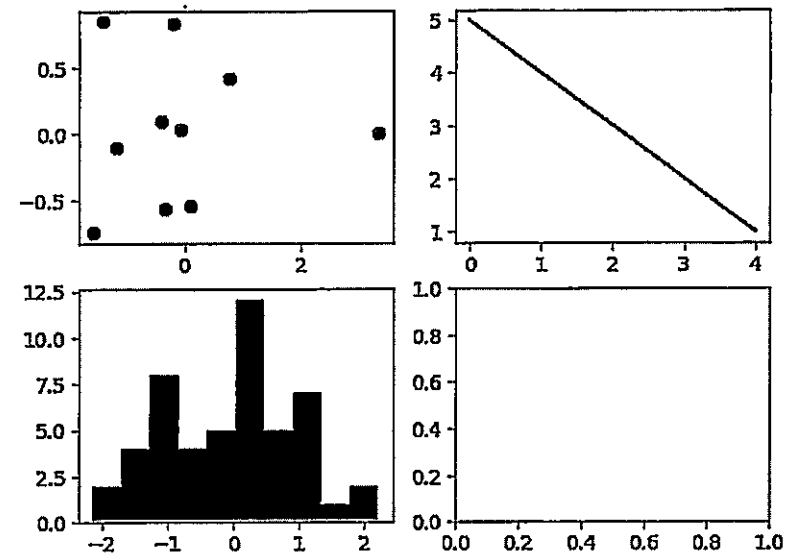
- (i) Generate a cross-tabulation to summarize the data by Dept and Category.
- (ii) Define a function to select the row with the largest values in the Salary column.
- (iii) Group the data by Dept.
- (iv) Apply the function defined in part (ii) to print the row with the maximum Salary for each group.

(i) State whether the following statements are True or False. (5)

- (i) Reshape and pivot tables are used for rearranging tabular data.

6. (a) Write Python commands to plot a 2×2 grid similar to the one shown below using matplotlib's figure and add_subplot method such that : (7)

- (i) Plot 1 is a scatter plot with 10 random points.
- (ii) Plot 2 is a line plot with 5 points in decreasing order.
- (iii) Plot 3 is a histogram with 50 randomly generated numbers plotted in 10 bins.
- (iv) Plot 4 is empty.



- (b) Consider the following data about five students enrolled in a course : (7.5)

RollNo	Dept	Age	Marks
2101	CS	18	87
2102	CS	19	45
2103	CS	19	69
3101	Stats	20	91
3102	Stats	21	56

Write commands in Python to

- (i) Create a DataFrame df to store the above data.
- (ii) Give the summary level statistics for data stored in df.
- (iii) Compute the correlation between columns Age and Marks.
- (iv) Compute the average marks obtained by students of each department.

- (ii) The dimension of a numpy array with shape (2, 1, 4) is 8.
- (iii) Plotly is an open-source library for interactive visualization.
- (iv) plot() function in the module matplotlib.pyplot draws scatter plots by default.
- (v) Pandas is designed to work with Series and DataFrames while NumPy is best suited for numeric arrays.

Section B

2. (a) Given the array arr1 : (5)

```
arr1 = np.array([[[3,-7], [9,2]], [[-15,4], [1,2]]])
```

Write numpy commands to perform the following operations :

- (i) Create an array of ones with the same shape as arr1.
- (ii) Print the elements of arr1 which are less than 2.

(iii) Print the dimensions of arr1.

(iv) Print the datatype of elements stored in arr1.

(b) Consider the following DataFrame df. (5)

	Col1	Col2
B	23	52
A	43	89
C	12	86

Write statements to perform the following operations :

- (i) Set the name of the index as ID.
- (ii) Add column Co 13 with the values 23, 12, 10.
- (iii) Find the index for the row containing the maximum value of Col2.
- (iv) Reindex df in the order A, B, and C.
- (v) Delete the row corresponding to index C.

(iv) draw a line graph using matplotlib, plotting a dashed line with black color, and the data points marked with an x sign on the drawn line.

5. (a) Given the DataFrame df: (7.5)

```
df = pd.DataFrame({
    'category': ['A', 'B', 'A', 'B', 'A'],
    'type': ['X', 'Y', 'Z', 'X', 'Y'],
    'value': np.arange(10, 20, 2)
})
```

What will be the output produced on the execution of the following code?

- (i) print(df)
- (ii) x1=df['value'].groupby([df['category'], df['type']]).mean()
print(x1)
- (iii) x2=df['value'].groupby(df['type']).mean()
print(x2)
- (iv) x3=dict(list(df.groupby('key1')))
print(x3['a'])

- (i) `print (data.T)`
- (ii) `print (data [~ (names == 'Raj')], 2:)`
- (iii) `print (data [[-2, -4, -7]])`
- (iv) `print (data [[1, 5, 2], [0, 0, 1]])`
- (v) `d1=data[0].copy`
`d1=13`
`print(data)`

(c) Consider the monthly rent (in INR thousands) for ten apartments in a city : (5)

`rent = [20, 12.5, 35, 47.5, 56, 22, 17.5, 31, 28, 40]`

Write python code to :

- (i) create a Pandas object to hold rents of apartments.
- (ii) display the average and total of the given rent values.
- (iii) display the rent values greater than the median rent.

- (c) In which situations is the `read_csv()` function used? List any two parameters used in the function and describe their significance giving suitable examples. (5)

3. (a) Given the following Series `ser1` and `ser2` in Pandas : (5)

ser1		ser2	
A	3	A	9
B	2	B	8
C	1	D	6
D	4	E	7

What will be the output produced on the execution of the following code?

- (i) `ser1.values`
- (ii) `ser2.index`
- (iii) `ser2[:3] * 5`
- (iv) `ser1 - ser2`
- (v) `ser2[: : -1]`

(b) How are missing values represented in Pandas?
Explain how the missing values are detected, removed and replaced using functions in Pandas.
(6)

(c) Consider the year-wise sales made by a salesman in the last ten years for product A: [80, 92, 88, 89, 100, 70, 78, 88, 80, 34] and product B: [35, 76, 35, 88, 100, 48, 79, 88, 65, 35]. Write Python statements to

(i) Import the necessary libraries and draw a scatter plot of year-wise sales of products A and B.

(ii) Label Y-axis of the plot as 'Sales'.

(iii) Title the plot as 'Comparison of Sales'.

(iv) Place ticks on the Y-axis as 30, 40, 50,..., 100.
(4)

4. (a) Consider the DataFrames First and Second given below :
(5)

First		Second	
C_One	C_Two	C_One	C_Two
0	W	0	X
2	X	1	Z
3	Y	3	U
6	Z	2	W

Consider the following python code segment :

```
right_res=pd.merge(First,Second,how='right', on='C_Two')
left_res=pd.merge(First, Second, how='inner', on='C_One')
```

Show the contents of the new DataFrames right_res and left_res.

(b) Consider the given Series names and data given below :
(5)

```
names = np.array(['Ram', 'Raj', 'Rahim', 'Shamshi', 'Gourav', 'Raj', 'Raj'])
```

```
data = np.arange(14).reshape(7,2)
```

What will be the output produced on the execution of the following code?

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[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 3281

H

Unique Paper Code : 42343602

Name of the Paper : PHP Programming (SEC)

Name of the Course : **B.Sc. Program / B.Sc.
Mathematical Science**

Semester : VI

Admission Year : 2019 onwards

Duration : 2 Hours

Maximum Marks : 25

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Question no. 1 is compulsory.
3. Attempt any 3 questions from Question no. 2 to 6.

1. (a) List the difference between GET and POST Methods. (2)

P.T.O.

(b) Explain the types of Comments in PHP with syntax. (2)

(c) If X=21 then what will be the values of Y and Z after execution of line 1 and line2 ? (2)

Line 1// Y=X++;

Line 2// Z=--X;

(d) Are the operators and 'AND' interchangeable? Justify. (2)

(e) Explain IMplode () function with a suitable example. (2)

2. (a) How is an object different from a function in PHP? (2)

(b) Write a function to swap two numbers passed as arguments to it. (3)

3. (a) List two built-in functions used with array in PHP. (1)

(b) Explain explicit type casting and implicit type casting with suitable examples. (4)

4. Write a PHP code to read three numbers from HTML Form and display the greatest number. (5)

5. What is a regular expression ? (1+2+2)

Write PHP code to perform the following :

(a) test whether the word CATS appear anywhere in a string "CATS ARE CRAZY. I LIKE CATS."

(b) replace all occurrences of the word CATS with the word DOGS in the string mentioned in (a).

6. (a) Create table STUDENT with the following attributes : (3+2)

(i) Name

(ii) Age

3281

4

(b) Insert a row in Student table with appropriate values.

(2500)

3377

8

(b) TELNET

(c) Radio Waves

(10)

(1500)

[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 3377

H

Unique Paper Code : 42347610

Name of the Paper : Computer Networks (DSE)

Name of the Course : **B.Sc. (Programme)**

Semester : VI

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. The paper has **two** sections.
3. All questions in '**Section A**' are compulsory.
4. Attempt any **five** questions from '**Section B**'.
5. Parts of a question must be answered together.

P.T.O.

Section A
(Compulsory)

1. (a) Consider the following data fragment in the middle of a data stream in a frame : (2)

A B ESC C ESC FLAG FLAG D

Give the output when byte-stuffing technique is used for framing.

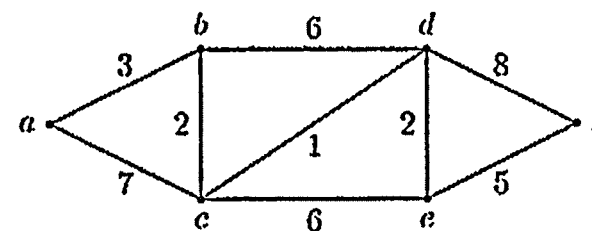
- (b) Name the layers on which the following networking devices operate : (2)

- (i) Bridge
- (ii) Router
- (iii) Gateway
- (iv) Hub

- (b) Classify computer networks according to the coverage area. (3)

8. (a) What is the difference between multicast and broadcast in terms of network traffic? Explain with suitable examples. (4)

- (b) Find the length and shortest path between "a" and "z" in the following weighted graph. (6)



9. Write short notes on the following (any two) :
- (a) Stop-and-Wait Protocol

(i) 208.34.54.12

(ii) 238.34.2.1

(iii) 114.34.2.8

6. (a) List the protocols that are used by modern E-mail Application system. Briefly discuss the role played by these protocols in the E-mail system. (6)

(b) A system has an n-layer protocol hierarchy. Applications generate messages of length M bytes. At each of the layers, an h-byte header is added. What fraction of the network bandwidth is filled with headers? (4)

7. (a) Briefly discuss the functionality of each layer of the ISO-OSI model. (7)

(c) Indicate whether the following employ connection-less or connection-oriented mechanism : (2)

(i) WhatsApp call

(ii) Facebook chat

(iii) Postal System

(iv) WhatsApp Message

(d) Describe the function of Address Resolution Protocol (ARP). In which layer does it operate? (2)

(e) List at least two differences between the internet and the extranet. (2)

2. (a) Differentiate between the star and bus topologies. List one benefit and one drawback for each. (3)

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- (b) What is the difference between a single-bit error, a two-bit error, and a burst error? (3)
- (c) Differentiate between circuit switching and packet switching. (3)
- (d) What is purpose of cladding in an optical fiber cable? Explain with the help of a diagram. (3)
- (e) What do understand by simplex, half duplex and full duplex mode of data communication? Give one example of each. (3)

Section B

(Attempt any Five)

- 3. (a) We want to transmit the bit-string "10110011" using Cyclic Redundancy Check (CRC). The generator bit-string is "1001". Obtain the transmitted bit-string. (4)

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- (b) What is the purpose of File Transfer Protocol (FTP)? Briefly explain the different transmission modes of FTP. (6)
- 4. (a) What do you understand by Domain Name System (DNS)? Which protocol does it use to resolve the name mapping? Discuss how domain name structure is organized. (6)
- (b) What are the components of a URL? And what punctuation is used to separate the components? (4)
- 5. (a) List the differences between ISO-OSI and TCP/IP protocol stacks. (4)
- (b) Find the class and subnet mask for each of the following IP addresses. (6)

P.T.O.