

Principles of Operating SystemsInstructions:

- 1) All questions are compulsory.
- 2) Mixing of sub questions is not allowed.
- 3) Write in clear, legible, writing.

Subject code: SCS101

Q1) Attempt any four: (5 marks each) (20)

1. What is an Operating System? Explain the Role of the Operating System
2. Explain the 5-state process model with a neat diagram
3. Write a short note on Scheduling Queues
4. Write a short note on Real Time Operating Systems
5. What are the operations performed on Process Creation? Explain
6. What is a Thread? What are the benefits of Multithreading?

Q2) Attempt any four: (5 marks each) (20)

1. Explain the Critical Section Problem
2. Write a short note on Bounded Buffer Problem
3. Explain the Round Robin (RR) scheduling algorithm. Consider the following processes alongwith their arrival time and CPU burst time in milliseconds. Considering RR scheduling, calculate their wait time, average wait time, turnaround time and average turnaround time. Also draw the Gantt Chart

Process	Arrival Time	Burst Time
P1	0	4
P2	1	5
P3	2	2
P4	3	1
P5	4	6
P6	5	3

4. How can Mutex locks be used to solve the critical section problem? Explain
5. What is the use of resource allocation graph? Explain with a diagram
Consider a system with five processes P_0 through P_4 and three resource types A , B , and C . Resource type A has ten instances, resource type B has five instances, and resource type C has seven instances. Give the sequence of process execution so that the system is in safe state using Bankers Algorithm. Suppose that, at time T_0 , the following snapshot of the system has been taken:

	<u>Allocation</u>	<u>Max</u>	<u>Available</u>
	A B C	A B C	A B C
P ₀	0 1 0	7 5 3	3 3 2
P ₁	2 0 0	3 2 2	
P ₂	3 0 2	9 0 2	
P ₃	2 1 1	2 2 2	
P ₄	0 0 2	4 3 3	

Q3) Attempt any four: (5 marks each) (20)

1. Explain the paging hardware with the help of a neat diagram. What are the advantages and disadvantages of Paging?
2. Write a note on segmentation and segmentation hardware with the help of neat diagrams. What are the advantages and disadvantages of segmentation?
3. Explain the following File Allocation Methods on a disk:- Contagious, Linked List
4. Explain the various techniques of free space management on a disk
5. What are the various operations that can be performed on a file?
6. Define the following terms related to virtual memory:-
 - a. Virtual Memory Paging
 - b. Virtual Memory Segmentation
 - c. Virtual address
 - d. Page fault
 - e. Pure Demand Paging

Q4) Attempt any five: (3 marks each) (15)

1. Write a short note on the layered Operating System structure
2. Explain the System Calls related to File Management with examples
3. Explain the Time Sharing Computing Environments
4. What are the different types of Semaphores? Explain
5. Explain the following terms related to CPU scheduling:-
 - a. CPU Scheduler
 - b. Dispatcher
 - c. Dispatch Latency
6. Define the following terms related to virtual memory:-
 - a. Virtual address
 - b. Page fault
 - c. Pure Demand Paging

Max Time: 2½ hrs

SYCS Semester III

Max Marks: 75

Linear Algebra

Subject Code: SCS102

Instructions:

- 1) All questions are compulsory.
- 2) Mixing of sub questions is not allowed.
- 3) Write in clear, legible, writing.

Q1) Attempt any four: (20)

- A) Express the following in standard form of complex number $x + iy$ and then find the complex conjugate $(1 - 2i)(3 + 2i)$
- B) Simplify a) $(5 + 3i)(2 - 7i)$ b) $(4 - 3i)^2$
- C) Write the properties for a set V to be vector space
- D) let $u = [1, -2, 4]$, $v = [3, 5, 1]$, and $w = [2, 1, -3]$ find
 a) $3u - 2v$ b) $5u + 3v - 4w$
 c) $u \cdot v, u \cdot w, v \cdot w$ d) $\|u\|, \|v\|, \|w\|$
- E) find $u \cdot v, v \cdot u, u + v, u - v, \|u\|, \|v\|$ where $u = (2, -5, 6)$ and $v = (8, 2, -3)$
- F) Express the following in polar form and find their arguments
 a) $\sqrt{3} + i$ b) $2 + 2i$

Q2) Attempt any four: (20)

- A) express M as the linear combination of A , B and C .
 $M = \begin{bmatrix} 1 & 2 \\ -2 & 5 \end{bmatrix}$, $A = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$, $B = \begin{bmatrix} 0 & 2 \\ 1 & -2 \end{bmatrix}$, $C = \begin{bmatrix} 0 & -1 \\ 2 & 3 \end{bmatrix}$
- B) Find the matrix of F relative to the standard basis $E = \{u_1, u_2\} = \{(1, 0), (0, 1)\}$ for linear mapping $F(x, y) = (2x + 3y, 4x - 5y)$.
- C) Show that the following set of vectors over $\mathbb{R}$ are linearly independent
 $\{(1, 2, 3), (1, -1, 2), (1, -4, 1)\}$
- D) For the following set, show that the given vectors over $\text{GF}(2)$ are linearly Independent $\{(1, 1, 1, 1), (1, 0, 1, 0), (0, 1, 1, 0), (0, 1, 0, 1)\}$
- E) for the given matrix find the row rank $\begin{bmatrix} 4 & 1 & 2 & 3 & 5 \\ 2 & 6 & 7 & 8 & 9 \\ 3 & 5 & 6 & 2 & 5 \\ 5 & 7 & 8 & 3 & 7 \end{bmatrix}$
- F) the basis given by $v_1 = (1, -1, 0)$, $v_2 = (1, 1, 0)$, $v_3 = (0, 1, 1)$. Find the coordinate representation of $v = (5, 3, 4)$ relative to the basis.

Q3) Attempt any four:

(20)

A) Solve the following system using Gaussian elimination method

$$x_1 + x_2 + x_3 = 1, \quad x_1 + 2x_2 + 2x_3 = 1, \quad x_1 + 2x_2 + 3x_3 = 1$$

B) consider the subspace U of $\mathbb{R}^4$ spanned by the vectors to find orthogonal basis of U . $v_1 = (1,1,1,1)$, $v_2 = (1,1,2,4)$, $v_3 = (1,2,-4,-3)$ (hint Gram-Schmidt orthogonalization process)

C) Find the Eigen value and Eigen vector for the matrix $A = \begin{bmatrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix}$

D) Find the orthonormal basis for subspace of $\mathbb{R}^4$ generated by the following

(a) $(1,2,1,0)$ and $(1,2,3,1)$ (b) $(1,1,0,0)$, $(1,-1,1,1)$ and $(-1,0,2,1)$

E) Suppose $v = (1,2,3,4,6)$. Find the projection v on two in other word find w that minimizes $\|v-w\|$ where W is a subspace of $\mathbb{R}^5$ spanned by

$$u_1 = (1,2,1,2,1) \text{ and } u_2 = (1,0,1,5,-1)$$

F) let $u=(1,3,-4,2)$, $v=(4,-2,2,1)$ and $w=(5,-1,-2,6)$ in $\mathbb{R}^4$

(a) show $\langle 3u-2v, w \rangle = 3\langle u, w \rangle - 2\langle v, w \rangle$ (b) also normalize u, v and w

Q4) Attempt any five:

(15)

A) for each of the following problems calculate the answer over $GF(2)$

$$a) 1 + 1 + 1 + 0 \quad b) 1.1 + 0.1 + 0.0 + 1.1$$

$$c) (1 + 1 + 1 + 1) \cdot (1 + 1 + 1)$$

B) Calculate the magnitude of the following vector and find their unit vector

$$a) (1,1,1) \quad b) (0,1,1,0)$$

C) Compute the following matrix-vector products.

$$a) \begin{bmatrix} 1 & -1 \\ 1 & -1 \end{bmatrix} * [0.5, 0.5] \quad b) \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 4 & 5 \end{bmatrix} * [1, 2, 3]$$

D) for the following matrices find the row rank $\begin{bmatrix} 2 & 3 \\ 6 & 5 \end{bmatrix}$

E) Find k so that u and v are orthogonal to each other.

$$(a) u = (2,3k,-4,1,5) \text{ and } v = (6,-1,3,7,2k) \quad (b) u = (3,k,-2) \text{ and } v = (6,-4,-3)$$

F) Expand (a) $\langle 3u+5v, 4u-6v \rangle$ (b) $\|2u - 3v\|^2$

Data Structures Subject Code: SCS103Instructions:

- 1) All questions are compulsory.
 - 2) Mixing of sub questions are not allowed.
 - 3) Write in clear and legible writing.
-

Q I Attempt any **FOUR** (20)

- A) Explain different types of data structures and give their classifications.
- B) What is Linked List? Explain different types of ADT of Linked List.
- C) What is Stack? Explain Advantages and Disadvantages of Stack.
- D) Explain Application of Stack like prefix to postfix notation with the help of an Example.
- E) What is Queue? Explain different types of ADT of Queue.
- F) What is Circular Queue? Explain Advantages and Disadvantages of Circular Queue.

Q II Attempt any **FOUR** (20)

- A) What is Doubly Linked List? Explain Advantages and Disadvantages of Doubly Linked List.
- B) Explain Basic Operation carried out in Doubly Linked List
- C) What is Tree? Explain different types of ADT of Tree.
- D) What is Balanced BST? Explain with the help of an Example
- E) Explain Implementation and Traversals of Tree's.
- F) Explain Application of Heaps with the help of an Example.

Q III Attempt any **FOUR** (20)

- A) What is Graph? Explain Advantages and Disadvantages of Graph.
- B) Explain Basic Operation carried out in Graph.
- C) Explain Graph Representation using adjacency matrix.
- D) Explain Graph operations like deletion of nodes.
- E) Explain Concept of Hashing.
- F) Explain Collision? Explain Different types of Collision Avoidance techniques.

Q IV Attempt any **FIVE** (15)

- A) What is ADT? How does the user Creates user-specific ADT?
- B) Explain Application of Linked List like Polynomial Equation with the help of an Example.
- C) What is Doubly Linked List? Explain different types of ADT of Doubly Linked List.
- D) Explain Insertion and deletion of nodes at various positions in Doubly Linked List.
- E) What is Graph? Explain different types of ADT of Graph.
- F) Explain Graph Traversals with the help of BFS Algorithm.

Advanced Database ConceptsInstructions:*Subject code: SCS104*

- 1) All questions are compulsory.
 - 2) Mixing of sub questions is not allowed.
 - 3) Write in clear, legible, writing.
-

Q1) Attempt **any four**: (20)

- A) Explain the Architecture of PL/SQL?
- B) Explain the various datatype of used in PL/SQL with example.
- C) What are PL/Sql control structures?
- D) Write the short note in sequence?
- E) What is a function?
- F) What are the types of stored type procedure

Q2) Attempt **any four**: (20)

- A) Write a note on dynamic SQL & embedded SQL?
- B) What do we mean by exception? Explain types of exceptions with examples?
- C) Write a short note on implicit cursor, explicit cursor, for loops?
- D) What is a Nested table?
- E) Explain type of Exceptions?
- F) What are the various collection types?

Q3) Attempt **any four**: (20)

- A) What are Triggers? Give an example?
- B) What are packages? Give an example?
- C) What is database backup? Why is backup needed?
- D) write a short note on commit and rollback ?
- E) Explain ARIES algorithm of lock based protocol?
- F) Explain the type of Trigger?

Q4) Attempt **any five**: (15)

- A) Explain the components of the trigger?
- B) Write a short note on
 - a) FOR Loops
 - b) Case Statements
 - c) While loops
- C) What is recovery ? Explain the type of recovery?
- D) Explain VARRAY in PL/SQL?
- E) Explain the various types of cursor with example?
- F) Explain the features of PL/SQL values.

Java Based Application DevelopmentInstructions:

- 1) All questions are compulsory.
- 2) Mixing of sub questions is not allowed.
- 3) Write in clear, legible, writing.

Subject Code: SCS105

Q1) Attempt any four:

(20)

- A) Describe how Java achieves portability and architecture-neutrality.
- B) Explain 'overloading' and 'overriding' in java.
- C) Explain five built-in exceptions of Java Library.
- D) Write a program in Java to create a class called 'Rational' for performing arithmetic with fractions. Provide appropriate constructors to initialize the fraction. Implement methods to add and multiply two fraction objects.
- E) Write a program in Java to create a class called Complex for performing addition and multiplication of two complex numbers. Implement the appropriate constructor.
- F) Write a program in Java to create a class called Point. Implement the appropriate constructor. Implement methods for returning the distance of the calling point from another point passed as an argument of the method.

Q2) Attempt any four:

(20)

- A) Describe 5 methods of 'ArrayList'.
- B) Explain the JComboBox component of Swing.
- C) Explain with examples the creation of threads in Java.
- D) Write a program in Java to create a GUI application for converting meters to kilometers. Provide the appropriate GUI elements for the application.
- E) Write a program in Java which creates two threads. One printing 'Pass' and the other printing 'Fail'.
- F) Write a program in Java to insert a record in the Student table. The Student table has the following fields: Id, first_name, last_name, course, age.

Q3) Attempt any four:

(20)

- A) Explain the life cycle of a servlet.
- B) Explain five methods of 'Session' class.
- C) Explain the scripting elements in JSP with examples.
- D) Write a servlet which calculates the Gross salary of the person. Assume that basic pay is available from the previous HTML page and DA is 10%, HRA is 20% of the basic pay.
- E) Write a JSP page which checks if a number is even or odd. The number is available in the current page through the variable name 'num'.

Java Based Application DevelopmentInstructions:

- 1) All questions are **compulsory**.
- 2) Mixing of sub questions is not allowed.
- 3) Write in clear, legible, writing.

Subject Code: SCS105

Q1) Attempt any four:

(20)

- A) Describe how Java achieves portability and architecture-neutrality.
- B) Explain 'overloading' and 'overriding' in java.
- C) Explain five built-in exceptions of Java Library.
- D) Write a program in Java to create a class called 'Rational' for performing arithmetic with fractions. Provide appropriate constructors to initialize the fraction. Implement methods to add and multiply two fraction objects.
- E) Write a program in Java to create a class called Complex for performing addition and multiplication of two complex numbers. Implement the appropriate constructor.
- F) Write a program in Java to create a class called Point. Implement the appropriate constructor. Implement methods for returning the distance of the calling point from another point passed as an argument of the method.

Q2) Attempt any four:

(20)

- A) Describe 5 methods of 'ArrayList'.
- B) Explain the JComboBox component of Swing.
- C) Explain with examples the creation of threads in Java.
- D) Write a program in Java to create a GUI application for converting meters to kilometers. Provide the appropriate GUI elements for the application.
- E) Write a program in Java which creates two threads. One printing 'Pass' and the other printing 'Fail'.
- F) Write a program in Java to insert a record in the Student table. The Student table has the following fields: Id, first_name, last_name, course, age.

Q3) Attempt any four:

(20)

- A) Explain the life cycle of a servlet.
- B) Explain five methods of 'Session' class.
- C) Explain the scripting elements in JSP with examples.
- D) Write a servlet which calculates the Gross salary of the person. Assume that basic pay is available from the previous HTML page and DA is 10%, HRA is 20% of the basic pay.
- E) Write a JSP page which checks if a number is even or odd. The number is available in the current page through the variable name 'num'.

F) Write a JSP page which displays the number and its square. The number is available in the current page through the variable name 'num'.

Q4) Attempt any five:

(15)

- A) Explain with examples three looping structures in Java.
- B) Explain integral literals in Java.
- C) Explain the 'PreparedStatement' with an example.
- D) Explain the purpose of adaptor classes.
- E) Explain 3 implicit objects in JSP.
- F) Write a note on JSON with Java.

*Subject Code: SCS 106***Instructions:**

- 1) All questions are compulsory.
 - 2) Mixing of sub questions are not allowed.
 - 3) Write in clear and legible writing.
-

- Q.1 Attempt any **FOUR** (20)
- A) Explain any five text formatting tags with the help of example.
 - B) What are the types of lists? Explain with the help of example.
 - C) How to create table in HTML? Explain with its properties.
 - D) Explain the term Inline, Internal and External CSS in detail.
 - E) How to link pages in HTML? Give suitable example.
 - F) Create college admission form with suitable controls.
- Q.2 Attempt any **FOUR** (20)
- A) Differentiate between HTML and XML.
 - B) Discuss the popup boxes available in JavaScript.
 - C) Write a JavaScript code to print table of given number.
 - D) What is form validation? Write JavaScript validation code for mobile validation.
 - E) Discuss various types of operators available in JavaScript with suitable example.
 - F) Write JavaScript code to find factorial of given number.
- Q.3 Attempt any **FOUR** (20)
- A) Write a short note on XMLHttpRequest object.
 - B) Explain AJAX web application model in detail.
 - C) What are the rules to define variable in PHP.
 - D) Write a note on cookies.
 - E) Explain toggle (), hide () events of JQuery.
 - F) Which are the methods for creating animation effects in JQuery?
- Q.4 Attempt any **FIVE** (15)
- A) Write on CSS properties for positioning an element with the help of example.
 - B) How to use audio – video files in HTML?
 - C) Explain switch case statement in detail.
 - D) What is DTD? Discuss the different types of DTD?
 - E) What is control flow statement in PHP? Explain with the help of example.
 - F) Write a short note on loop control statements.

Creative Content WritingInstructions:

- 1) All questions are **compulsory**.
- 2) Mixing of sub questions is not allowed.
- 3) Write in clear, legible, writing.

Subject code: SCS107

Q1) Attempt **any four:** (20)

- A) Explain in brief professional content writing ?
- B) Write an ideal length for a blog post ?
- C) Explain Learning Tone in Writing and Its Types ?
- D) Explain list item in content writing?
- E) What are active verbs? Explain its type ?
- F) Write a comprehending style in writing and its types ?

Q2) Attempt **any four:** (20)

- A) Explain the writing of a hashtag with an example?
- B) How to write a page? What are the considerations to keep in mind while writing for the home page ?
- C) What is e-mail? Write steps for writing professional mail ?
- D) What is writing social media with humor? Give a step for how to tweet ?
- E) Write a note on 5 W's and H questions?
- F) What are infographics? Write about three tools available for infographics ?

Q3) Attempt **any four:** (20)

- A) Explain tools for content writing?
- B) What is google authorship? How does it benefit your SEO?
- C) What are plagiarism laws in content writing ?
- D) Explain ethical and legal aspects of content writing ?
- E) Write Note on:
 - i) Editing tools
 - ii) Google Authorship
- F) Write a short note on IPR laws ?

Q4) Attempt **any five:** (15)

- A) Write any five tools for content writing ?
- B) Write Ideal length for twitter post.
- C) Explain how to write for the home page and about us page?
- D) Write a note on hashtags ?
- E) What is an annual report ? How to start it ?
- F) Explain knowledge-based tools in detail.?