SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY, TUMKUR.

(A Constituent College of Sri Siddhartha Academy of Higher Education, Agalakote, Tumkur.)

B.E., SEMESTER END EXAMINATION – JULY 2022

IS4TH5: PYTHON FOR DATA PROCESSING

TIME: 3.00 Hrs   SEM: IV   MAX MARKS: 100

NOTE: Answer any five full questions selecting one full question from each choice.

		M	CO	BL
1.a)	Explain the following terms i. Python interpreter ii. Tab completion iii. Introspection	6	1	2
b)	Write a Python program to find the best of two tests average marks out of three test marks accepted from the user.	6	1	3

c)	Explain the following programming concepts with example.
	  i. Indentation, no braces ii. Mutable and immutable objects iii. Duck typing
	  iv. Dynamic references, strong types
		8	1	2

OR

		M	CO	BL
2.a)	Illustrate the usage of break and continue statement with examples.	6	1	2
b)	Implement a python program to convert temperature from Celsius to Fahrenheit and vice versa.	6	1	3
c)	Explain the conditional and looping constructs in Python.	8	1	2

		M	CO	BL
3.a)	Discuss Errors and Exception Handling in Python.	6	1	2
b)	Write a Python program to read a list of elements and check if an element is present in the list or not.	6	1	3

c)	Compare and contrast tuple and list. Explain the following operations in list with examples
	  i. Adding and removing elements
	  ii. Slicing
		8	3	4

OR

		M	CO	BL
4.a)	Explain the following sequence functions with example i. enumerate ii. zip	6	3	2
b)	Illustrate list, dict and set comprehensions with an example for each.	6	3	2
c)	Implement a python program to create a dictionary of 5 students details with name as key and marks obtained in six subjects as values. Find the student scoring highest total marks and print the student name and total marks obtained.	8	1	3

		M	CO	BL
5.a)	Explain any three functions to create arrays with example.	6	2	2
b)	Demonstrate the use of boolean indexing and fancy indexing of arrays in numpy module with examples.	6	2	2

c)	Write a python program to create array of shape (3,5) containing integer numbers using numpy module. Perform the following operations and display the results
	  i. Find the maximum and minimum number in the array
	  ii. Replace the first and second row elements with 5
	  iii. Multiply the last row elements with 4.
		8	1	3

OR

		M	CO	BL
6.a)	Illustrate the methods for boolean array and sorting in numpy module.	6	2	2
b)	Explain the use of any six ufunc (Universal functions) with example.	6	2	3
c)	Demonstrate any four basic array statistical methods with example.	8	1	3

		M	CO	BL
7.a)	Explain the two data structures provided by pandas with an example to create them.	6	3	2
b)	Explain any three summary statistics methods in pandas.	6	3	2

c) Write a pandas program to create and display a DataFrame from a specified dictionary data which has the index labels and demonstrate the following   8   4   3
   i. Select a specified rows and column.
   ii. Renaming a column
   iii. Dropping a specified number of rows

OR

9.a) Discuss index object and its methods in pandas.   6   2   2

b) Demonstrate function application and mapping in pandas.   6   2   2

c) Implement a program to create a DataFrame containing five rows and four columns and demonstrate the following   8   4   3
   i. To detect missing values of a given Data Frame and display true or false.
   ii. To replace NaNs with median or mean of the specified columns in a given Data Frame.

9.a) Explain with examples the parsing functions read_csv() and read_table()   6   3   2

b) Illustrate accessing JSON data in python.   6   3   2

c) Discuss how to handle missing data in data cleaning process.   8   4   2

OR

10.a) Demonstrate how to interact with databases in python using example code.   8   3   2

b) Discuss the following data transformation operations   12   4   2
   i. Removing duplicates.   ii. Replacing values   iii. Discretization and binning

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B.E. SEMESTER END EXAMINATIONS – JULY 2022

IS4TH4 : COMPUTER NETWORKS-I

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TIME: 3.00 Hrs   SEM: IV   MAX MARKS: 100

NOTE: Answer any five full questions selecting one full question from each choice.

		M	CO	BL
1.a)	Explain the four basic topologies of network. Mention the merits and demerits of each topology.	10	1	2
b)	Illustrate the different modes of data communication between any two devices.	6	1	2
c)	Differentiate between circuit switched and packet switched network.	4	1	2
	OR			
2.a)	Explain the functionality of each layer in TCP/IP protocol suite.	10	1	2
b)	Outline the steps followed during Encapsulation and Decapsulation of a message at source host and destination host.	6	1	2
c)	Explain Multiplexing and Demultiplexing at the three upper layers of TCP/IP protocol suite.	4	1	2
3.a)	What is transmission impairment? Explain the cause of transmission impairment in detail. Calculate the attenuation suppose a signal travels through a transmission medium and its power is reduced to one half.	10	2	3
b)	Define bit rate. Calculate the bit rate for a digitized voice channel obtained by digitizing a 4 kHz bandwidth analog voice signal. (Assume 2 samples per hertz).	6	2	3
c)	Explain parallel and serial data transmission modes.	4	2	2
	OR			
4.a)	Represent the data in 11001010 in the following Line coding scheme: i) Unipolar -NRZ ii) Polar-NRZ iii) Bipolar -Manchester iv) Bipolar -AMI v) Polar-RZ	10	2	3
b)	Describe the following parameters, used to measure the network performance. i) Bandwidth ii) Throughput iii) Latency iv) Propagation time v) transmission time vi) Queuing time	6	2	1
c)	Calculate the maximum bit rate for 2 signal level and 4 signal level for a noiseless channel with a bandwidth of 3000 Hz.	4	2	3
5.a)	Explain the implementation of Amplitude shift keying, Phase shift keying, frequency shift keying in detail.	10	2	2
b)	Illustrate the types of different Guided media transmission.	6	2	2
c)	Describe Frequency Hopping Spread Spectrum (FHSS).	4	2	2
	OR			
6.a)	Illustrate the working process of various categories of multiplexing with diagram.	10	2	2
b)	Explain different types of Analog-Analog modulation techniques.	6	2	2
c)	Describe the three phases of communication in switched network.	4	2	2
7.a)	Mention the purpose of ARP protocol. Explain ARP request and reply operations in detail.	10	2	2
b)	Outline the process of error detection in block coding with diagram.	6	3	2
c)	Explain hamming distance with suitable example.	4	3	2
	OR			
8.a)	Prove that the data word 1001 sent is error free using CRC division method, given that the generator polynomial is: x^3+x+1.	10	3	3
b)	Write an algorithm to check the traditional checksum.	6	3	2
c)	What is Forward Error Correction? Explain any one technique.	4	3	2

9.a)	Explain the characteristics and frame format of the standard Ethernet in detail.	10	4	2
b)	Outline the summary of standard Ethernet implementation. Explain any two of them with diagram.	6	4	2
c)	Explain the concept of Virtual LAN.	4	4	2

OR

10.a)	Illustrate the frame format and fields of MAC layer in detail.	10	4	2
b)	Explain Bluetooth architecture in detail.	6	4	2
c)	Write short note on: Switched Ethernet and Full Duplex Switched Ethernet.	4.	4	2

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B.E., SEMESTER END EXAMINATION – JULY 2022

IS4TH6 : MICROPROCESSOR AND EMBEDDED SYSTEMS

TIME: 3.00 Hrs　　　　　　SEMESTER : IV　　　　　　MAX MARKS: 100

NOTE: Answer any five full questions selecting one full question from each choice.

		Marks	CO	BL
1.a)	Explain ARM core dataflow model and mention different registers of ARM Processor.	8	1	1
b)	Explain different operating modes of ARM Processor.	6	1	1
c)	Write and explain various fields of current program status register.	6	1	1
	OR			
2.a)	Differentiate between RISC and CISC. Explain the four major rules of RISC design.	6	1	2
b)	Explain Embedded System Hardware with the help of a block diagram.	8	1	1
c)	Explain ARM registers showing registers used in different modes.	6	1	2
3.a)	With example, explain the following ARM instructions 　　i) MVN　ii) ADC　iii) BIC　iv) ASR　v) MRS	10	2	2
b)	Explain Barrel Shifter operations.	6	2	2
c)	Explain multiply register instructions of ARM Processor.	4	2	2
	OR			
4.a)	Explain the following ARM instructions with an example for each 　　i) LSL　ii) ROR　iii) LDM　iv) LDR　v) CMP	10	2	2
b)	Write a program that prints square of the integers between 0 to 9.	4	2	3
c)	Explain unconditional and conditional branch instructions of ARM processor.	6	2	2
5.a)	Explain the architectural diagram of LPC 2148 microcontroller with a neat diagram.	8	1	1
b)	With the help of a diagram explain the memory mapping of ARM LPC 2148 microcontroller.	6	1	2
c)	Interface 7 segment display to ARM LPC 2148 and write a program to display 0 to 9.	6	3	3
	OR			
6.a)	Explain the interfacing of stepper motor through the driver circuit to microcontroller and write a program to move stepper motor in clockwise direction.	8	2	3
b)	Explain general purpose Input/output ports (GPIO) of LPC 2148 ARM microcontroller and Pin control block.	6	1	1
c)	Interface UART to LPC 2148 and show how it is used for serial communication.	6	3	3
7.a)	What is a transducer? What are the basic operating principles of a sensor.	6	4	1
b)	Explain temperature sensor to measure temperature.	5	4	1
c)	Explain the operation of motion sensor.	4	4	1
d)	Explain the working of proximity sensor with the help of a diagram.	5	4	1

OR

8.a)	Explain how photodiode and light dependent resistors are used as light sensors.	8	4	2
b)	Write a note on moisture sensor.	6	4	1
c)	Explain the operation of Gas and Chemical sensors.	6	4	1
9.a)	Differentiate between General purpose computing system and Embedded system	4	1	2
b)	Explain the Core of Embedded System.	8	1	2
c)	Explain classification of embedded systems depending on generation, complexity and performance.	8	1	1

OR

10.a)	Define embedded system ? Explain the purposes of embedded systems with an example for each.	8	1	1
b)	Explain different onboard communication interfaces in brief.	8	3	2
c)	Write a note on embedded firmware.	4	2	1

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B.E., SEMESTER END EXAMINATION – JULY 2022

IS4TH3 : ALGORITHM DESIGN AND ANALYSIS

TIME: 3.00 Hrs   **SEM: IV**   **MAX MARKS: 100**

NOTE: Answer any five full questions selecting one full question from each choice.

		M	CO	BL
1.a)	With the help of a flow chart, explain the various stages of algorithm design and analysis process.	6	1	1
b)	Trace for the given elements using selection sort technique 7, 4, 3, 8, 5	4	2	3
c)	Give the general plan for analyzing the efficiency of recursive algorithm. Build a recursive algorithm to find a factorial of a given number and find its efficiency.	10	2	3

OR

		M	CO	BL
2.a)	Define Big-Oh and Big-Theta notations. Give an example for each.	6	1	2
b)	Outline an exhaustive search method to solve travelling salesman problem.	4	1	2
c)	What is Brute force method? With an algorithm and a suitable example, explain how the brute force string matching algorithm works.	10	2	2

		M	CO	BL
3.a)	Apply quick sort technique to sort the data set 5, 3, 1, 9, 8, 2, 4, 7	6	4	3
b)	Show how insertion sort algorithm arranges the given numbers in increasing order 11, 9, 32, 5, 7	4	2	3
c)	Give the pseudo code for merge sort and analyze its time complexity. Trace its application to the given data 9, 4, 3, 8, 6, 2,1, 5, 7	10	3	4

OR

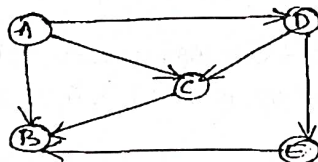|		M	CO	BL
4.a)	Give the general form of divide and conquer recurrence relation and explain how you can solve it using Master's theorem.	6	1	2
b)	Apply source removal method to solve topological order for the graph given in Fig.Q4(b)	4	4	3

Fig. Q4(b)

		M	CO	BL
c)	Write an algorithm for finding maximum and minimum elements in an array of 'n' numbers using divide and conquer technique and trace the array 22, 13, -5, -8, 15, 60, 17, 31, 47	10	3	2

		M	CO	BL
5.a)	What is an AVL tree? Explain the rotations of AVL tree. Construct an AVL tree for the list 8, 9, 11, 6, 5, 7, 10	10	2	3
b)	Write an algorithm for heap sort and construct a heap for the items 50, 25, 30, 75, 100, 45, 80 using bottom-up approach.	10	3	2

OR

		M	CO	BL
6.a)	Write Horspool's algorithm for pattern matching. Apply it to search for the pattern SAHIL in the text WELCOME TO SAHIL WORLD	10	3	2
b)	When does the collision occur in hashing? Arrange the following keys in the hash table of size 10 using open hashing technique. A, POOL, AND, MONEY, PARTED	10	2	3

7.a) Implement greedy technique to find the single source shortest path with vertex 'a' as the source node for the graph in Fig.Q7(a)   10 4 3
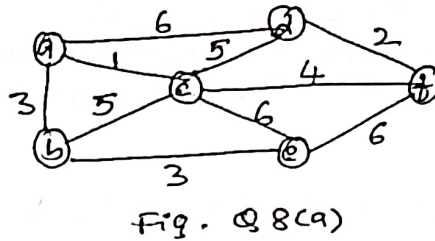

Fig. Q7(a)
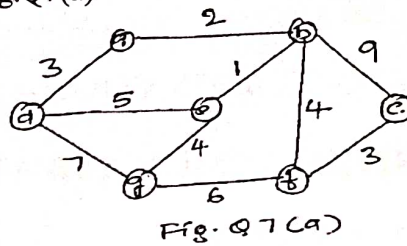
b) Write an algorithm to construct an Huffman tree and construct the Huffman tree for the following data   10 3 3

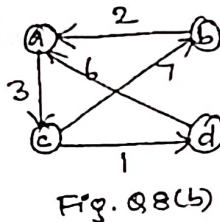| Character	A	B	C	D	-
Probability	0.35	0.1	0.2	0.2	0.15

  i)   Encode the text DAD
  ii) Decode the encoded bit string 10011011011101

OR

8.a) Find the minimum spanning tree using prim's algorithm for the graph given below in Fig.Q8(a)   10 4 3

Fig. Q8(a)

b) Using Floyd's algorithm, find all pair shortest paths for the following graph in Fig.Q8(b)   10 4 3

Fig. Q8(b)

9.a) Explain how back tracking is used for solving 4 Queens problem. Write the state space tree.   10 2 3
b) Solve subset sum problem for the following example, S={3, 5, 6, 7} and D=15. Construct a state space tree.   10 4 3

OR

10.a) Solve the following instance of knapsack problem by using branch and bound algorithm   10 4 3

Item	Weight	Profit
1	4	40
2	7	42
3	5	25
4	3	12

b) Solve the assignment problem for the following instance and obtain the optimal solution   10 4 3

	J1	J2	J3	J4
P1	9	2	7	8
P2	6	4	3	7
P3	5	8	1	8
P4	7	6	9	4

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B.E., SEMESTER END EXAMINATION – JULY 2022

MA4CS1/MA4IS1 : COMBINATORICS AND LINEAR ALGEBRA

TIME: 3.00 Hrs   SEM: IV   MAX MARKS: 100

NOTE: Answer any five full questions selecting one full question from each choice.

		M	CO	BL
1.a)	Use Taylor's series method to find y at x=0.1, 0.2, 0.3 considering terms up to third degree given that $\frac{dy}{dx} = x^2 + y^2$, $y(0) = 1$.	6	1	3
b)	Given that $\frac{dy}{dx} = 1 + \frac{y}{x}$ and y=2 at x=1. Find the approximate value of y at x=1.4 by taking h=0.2, applying Modified Euler's method.	7	1	3
c)	If $\frac{dy}{dx} = 2e^x - y$, y(0)=2, y(0.1)=2.010, y(0.2)=2.040, y(0.3)=2.090 find y(0.4). Correct to four decimal places using Adam's-Bashforth method.	7	1	3

OR

		M	CO	BL
2.a)	Use fourth order Runge-Kutta method to compute y(1.1) given that $\frac{dy}{dx} = xy^{1/3}$ with y(1)=1 .	6	1	3
b)	Evaluate $\int_0^1 \frac{dx}{1+x^2}$ by using Simpson's 1/3rd rule taking four equal strips and hence deduce an approximation value of π.	7	1	3
c)	Given $\frac{dy}{dx} = x - y^2$ and y(0)=0, y(0.2)=0.02, y(0.4)=0.0795, y(0.6)=0.1762. Compute y(0.8) by applying Milne's predictor-corrector formula.	7	1	3

		M	CO	BL
3.a)	Find the sequence generated by the functions i) $3x^3+e^{2x}$ ii) $(3+x)^3$.	6	2	1
b)	Find the generating function for each of the sequences i) 1, 2, 3, 4, 5… ii) 0, 1, 2, 3, 4…	7	2	1
c)	Using exponential generating function find the number of ways in which 4 of the letters in **ENGINE** be arranged.	7	2	1

OR

		M	CO	BL
4.a)	Using generating function, determine the co-efficient of x^5 in the expression $(1-2x)^{-7}$.	6	2	5
b)	Using the generating function, find the number of non-negative integer solutions of the equation $x_1 + x_2 + x_3 + x_4 = 25$	7	2	3
c)	Using the generating function, find the number of partitions of $n=4$.	7	2	5

		M	CO	BL
5.a)	Find LU-factorization of the matrix $A = \begin{bmatrix} 2 & 4 & -1 & -5 & -2 \\ -4 & -5 & 3 & -8 & 1 \\ 2 & -5 & -4 & 1 & 8 \\ -6 & 0 & 7 & -3 & 1 \end{bmatrix}$.	6	3	1
b)	Show that the vectors $u = (1, 2, 3)$, $v = (2, 5, 7)$, $w = (1, 3, 5)$ are linearly independent for the vector equation $xu + yv + zw = 0$, where x, y, z are unknown scalars.	7	3	5
c)	Let R be the field of real numbers. Show that the set $W = \{x, 2y, 3z : x, y, z \in R\}$ is a subspace of $V_3(R)$.	7	3	1

OR

6.a) Express the polynomial $v = 3t^2 + 5t - 5$ as a linear combination of the polynomials $p_1 = t^2 + 2t + 1$, $p_2 = 2t^2 + 5t + 4$, $p_3 = t^3 + 3t + 6$.   6   3   1

b) Solve the following system of equations by LU-factorization method $2x+3y+z=9$, $x+2y+3z=6$, $3x+y+2z = 8$.   7   3   5

c) Determine if columns of the following matrices are linearly independent $A = \begin{bmatrix} 0 & -8 & 5 \\ 3 & -7 & 4 \\ -1 & 5 & -4 \\ 1 & -3 & 2 \end{bmatrix}$.   7   3   1

7.a) Show that the vectors $(1, 2, 1), (2, 1, 0), (1, -1, 2)$ forms a basis of R^3.   6   3   1

b) Let F be a field. Then the mapping $T : F^2 \to F^3$ given by $T(a,b) = (a, b, 0)$ for all $(a,b) \in F^2$. Show that T is a linear transformation.   7   3   1

c) Find the matrix of linear transformation $T : V_2(R) \to V_3(R)$ such that $T(-1,1) = (-1, 0, 2)$, $T(2,1) = (1, 2, 1)$.   7   3   2

OR

8.a) Show that the set $S = \{(1, 2), (3, 4)\}$ forms a basis of R^2.   6   3   1

b) Find a linear transformation $T : V_2(R) \to V_2(R)$ such that $T(1,2) = (3, 0)$ and $T(2,1) = (1, 2)$.   7   3   1

c) Find the matrix of the linear transformation $T : V_3(R) \to V_3(R)$ defined by $T(x, y, z) = (x + y, y + z)$ with standard basis.   7   3   1

9.a) Let V be an inner product space and $u, v \in V$. Simplify $\langle 2u - 5v, 4u + 6v \rangle$.   6   4   4

b) R^3 is an inner product space with respect to standard inner product. Find the angle between the vectors $u = (1, 1, 2)$ and $v = (2, -1, 1)$.   7   4   1

c) Determine which set of vectors are orthogonal $\begin{bmatrix} -1 \\ 4 \\ -3 \end{bmatrix}, \begin{bmatrix} 5 \\ 2 \\ 1 \end{bmatrix}, \begin{bmatrix} 3 \\ -4 \\ 7 \end{bmatrix}$.   7   4   1

OR

10.a) Apply Gram- Schmidt orthogonalization process to the basis $B = \{(1, 0, 1), (1, 0, -1), (0,3,4)\}$ of the inner product space R^3 to find an orthonormal basis of R^3.   10   4   4

b) Find QR factorization of $A = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$.   10   4   1

Common for: CSE & ISE

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B.E., SEMESTER END EXAMINATION – JULY 2022

IS4TH2 : OPERATING SYSTEMS

TIME: 3.00 Hrs **SEM: IV** **MAX MARKS: 100**

NOTE: Answer any five full questions selecting one full question from each choice.

		M	CO	BL
1.a)	Describe the Operating System's role from different viewpoints.	6	1	2
b)	Explain the Operating System structure with the help of memory layout for a multiprogramming system.	6	1	2
c)	Designate the architecture of Google's Android with a neat diagram.	8	1	2
	OR			
2.a)	Describe Multiprocessing system and Clustered system	6	1	2
b)	Write a short note on: i)Cloud computing ii) Real-Time Embedded systems	8	1	1
c)	Define system calls. Explain with an example of how system calls are used.	6	1	1
3.a)	What is process? Explain process state with a neat diagram.	6	2	1
b)	Describe Multilevel Queue Scheduling and Multilevel Feedback Queue Scheduling.	8	2	2
c)	Discuss the issues in designing multithreaded programs.	6	2	3
	OR			
4.a)	Explain Interprocess Communication with several reasons for providing an environment that allow process cooperation	8	2	2
b)	Consider the following set of processes, with the length of the CPU burst given in milliseconds:	6	2	3

Process	Burst Time
P1	2
P2	1
P3	8
P4	4
P5	5

The processes are assumed to have arrived in the order P1,P2,P3,P4,P5 all at time 0.
i. Draw four Gantt charts that illustrate the execution of these processes using the following scheduling algorithms: First Come First Serve and Round Robin (quantum=2 ms)
ii. What is the waiting time of each process for each of these scheduling algorithms?
iii. Which of the algorithms results in the minimum average waiting time(over all processes)?

		M	CO	BL
c)	Discuss the strategy for scheduling criteria.	6	2	3
5.a)	What is critical section? What requirement should be satisfied for a solution to the critical section problem?	6	2	1
b)	Explain Reader-Write problem with semaphore in detail.	6	2	2
c)	What is a deadlock? Explain how resource allocation graph can be used to check for deadlock in a system.	8	2	2
	OR			
6.a)	Define semaphores. Explain its usage and implementation.	8	2	2

b)' Consider the following snapshot of a system:

	Allocation	Max
	A B C D	A B C D
P0	3 0 1 4	5 1 1 7
P1	2 2 1 0	3 2 1 1
P2	3 1 2 1	3 3 2. 1
P3	0 5 1 0	4 6 1 2
P4	4 2 1 2	6 3 2 5

12 2 3

Using the Banker's algorithm, determine whether or not each of the following states is unsafe. If the state is safe, illustrate the order in which the processes may complete. Otherwise, illustrate why the state is unsafe.
   i) Available = (0,3,0,1)
   ii) Available = (1,0,0,2)

7.a) Explain the common techniques for structuring the page table.   6   3   2
   b) Describe contiguous Memory Allocation in Memory Management.   8   3   2
   c) Elucidate allocation of frames in Virtual–Memory Management.   6   3   2

OR

8.a) Describe segmentation type of memory management with the help of neat diagram.   8   3   3
   b) Consider the following page reference string   6   3   4
   1, 2, 3, 4, 1, 2, 5, 1, 2, 3, 4, 5
   For a memory with three frames.
   How many page faults would occur for following replacement algorithm?
   i) FIFO replacement
   ii) Optimal replacement.
   c) Discuss demand paging with a neat diagram.   6   3   3

9.a) Explain Host-Attached Storage, Network-Attached Storage and Storage-Area Network in Disk Attachment.   6   4   2
   b) Briefly describe any two Disk Scheduling algorithms in Mass-Storage Structure with an example.   8   4   3
   c) Describe Directory Implementation in Implementing File-System.   6   4   3

OR

10.a) Summarize the Free-Space Management in Implementing File-System.   6   4   3
   b) Explain File-System Implementation in detail.   6   4   2
   c) Discuss the goals and principles of protection in a modern computer system.   8   4   3

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