

SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY, TUMKUR.
 (A Constituent College of Sri Siddhartha Academy of Higher Education, Agalakote, Tumkur.)

B.E. SEMESTER END EXAMINATIONS – JULY 2022

CS4TH3: Operating Systems

TIME: 3.00 Hrs.

SEM: IV

MAX MARKS: 100

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

- | | |
|---|--|
| 1.a) Define an Operating System. Explain the various components of a computer system.
b) Explain the advantages of multiprocessor systems?
c) Explain the following operating system structure.
i) Layered Approach ii) Modules | M CO BL
6 1 1
6 1 1
8 2 2 |
|---|--|

OR

- | | |
|---|-------------------------------------|
| 2.a) Outline the services provided by the operating system to users.
b) List the explain types of system calls.
c) Discuss the following Hybrid systems structure.
i) iOS ii) Android | 6 1 1
6 1 2
8 2 1 |
| 3.a) Explain the services provided by the operating system for the efficient operation of the system.
b) Explain different multithreading models.
c) For the process listed below, draw Gantt Charts using preemptive and non-preemptive priority scheduling algorithm. A lower priority number as a higher priority .Calculate average waiting time and average turnaround time. | 6 1 1
6 2 2
8 3 2 |

Process	Arrival Time	Burst Time	Priority
p1	0	6	4
p2	3	5	2
p3	3	3	6
p4	5	5	3

OR

- | | |
|---|-------------------------------------|
| 4.a) Discuss the different methods to Implement the message passing IPC in detail.
b) Discuss different benefits of multithreading models.
c) Consider the following set of processes , with the length of the CPU burst given in milliseconds: | 8 2 2
6 2 1
6 3 2 |
|---|-------------------------------------|

Process	Burst Time	Priority
p1	10	3
p2	1	1
p3	2	3
p4	1	4
p5	5	2

The process are assumed to have arrived in the order p1, p2, p3, p4, p5, at all-time 0.

- i) Draw four Gantt charts that illustrate the execution of these processes using scheduling algorithm; FCFS, SJF, non-preemptive priority (a smaller priority number implies a higher priority).
- ii) Which of the algorithms results in the minimum average waiting time (over all processes)?

- 5.a) Explain solution to the critical section problem using mutex locks. 6 3 2
 b) Explain readers-writers problem with semaphores in detail. 6 3 2
 c) For the following snapshot find need matrix and calculate safe sequence by using Banker's algorithm. Mention above system is safe or not safe. 8 3 2

	Allocation			Max			Available		
	A	B	C	A	B	C	A	B	C
P ₀	0	0	2	0	0	4	1	0	2
P ₁	1	0	0	2	0	1			
P ₂	1	3	5	1	3	7			
P ₃	6	3	2	8	4	2			
P ₄	1	4	3	1	5	7			

OR

- 6.a) Explain Peterson's solution for critical section problem. 6 3 2
 b) Explain Dining-Philosophers problem with semaphores in detail. 6 3 2
 c) What is Resource allocation graph (RAG)? Illustrate with an example of RAG with a deadlock and RAG with a cycle but no deadlock 8 3 2

- 7.a) Write a neat diagram explain the Segmentation Hardware. 6 4 3
 b) Differentiate between sequential and direct file access methods? 6 4 1
 c) Consider the following sequence 8 4 2

R=7,0,1,2,0,3,0,4,2,3,0,3,2,1,2,0,1,7,0,1. How many page fault occur with three page frames

- i) FIFO
- ii) optimal page replacement
- iii) LRU page replacement algorithm

OR

- 8.a) Write a neat diagram explain the two level page table 6 4 2
 b) What is demand paging? Explain the steps in handling page fault with a neat diagram 6 4 2
 c) Consider the following page reference stream R=0,1,2,3,0,1,4,0,1,2,3,4. Calculate the number of page fault when number of frame is 3 and 4 using FIFO algorithm. Do you notice Belady's Anomaly? 8 4 3

- 9.a) Explain the access matrix model for implementing protection in operating system. 10 4 2
 b) A disk has 200 cylinders, numbered 0 to 199. The disk head is initially at cylinder 46. The queue of pending requests in FIFO order is 86,170,113,177,48,109,102,175,130. Starting from the current head position, what is the total distance traveled (in cylinder) by the disk arm to satisfy the pending requests using algorithms
 (i) FCFS (ii) SCAN. Illustrate with figures in each case.

OR

- 10.a) Suppose that a disk drive has 200 cylinders, numbered 0 to 199. The drive is currently serving a request at cylinder 60 and previous request was at cylinder 58. The queue of pending requests in FIFO order is 87, 170, 40, 150, 36, 72, 66, and 115. Starting from the current head position, what is the total distance that satisfy all the pending requests for each of the following disk scheduling algorithm?
 i) FCFS ii) SSTF 10 4 3
 b) What is domain? Explain domain switching and the ways domains can be realized. 10 4 2

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

CS4TH2 : DESIGN AND ANALYSIS OF ALGORITHMS

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~~ a) With the help of a flow chart, explain the fundamentals of algorithmic problem solving. 10 1 1
 b) What is asymptotic? Why asymptotic notations? Describe with an example. 10 1 2

OR

- 2.a) Solve the following recurrence relation 10 3 2
 i) $T(n) = T(n - 1) + 5$ for $n > 1$
 $T(1) = 0$
- ii) $T(n) = 3T(n - 1)$ for $n > 1$
 $T(1) = 4$
- b) Describe the following using Brute Force Algorithm Design technique: 10 1 2
 i) String Matching
 ii) Travelling Salesman
- 3.a) Design a stable algorithm using divide and conquer technique and find its efficiency. Trace the algorithm for the data: 6, 5, 3, 1, 2, 7, 4, 9 10 3 3
 b) Explain three variation of decrease and conquer. Find the topology using source removal method for the graph (fig 3b). 10 4 3

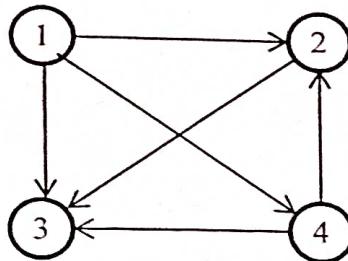


Fig: 3b

OR

- ~~4.a~~ a) Find worst case, best case, and average case efficiency of Quick sort algorithm. Is it In-place algorithm or not? 10 3 2
 b) Write a C function to sort the elements using insertion sort and trace the function for the data 10, 20, 30, 40, 15, 25, 35, 45 10 3 3
- ~~5.a~~ a) What is an AVL tree? Construct AVL tree for the list 8, 9, 11, 6, 5, 7, 10 10 2 2
 b) Explain separate chaining and linear probing in hashing with an example. 10 1 2

OR

- 6.a) What is 2-3 tree? Construct 2-3 tree for the list 8, 9, 11, 6, 5, 7, 10. 10 2 2
- b) Write a C function for string matching using input enhancement method. Apply it to search for the pattern BAOBAB in the text BESS_KNEW_ABOUT_BAOBABS 10 4 3

- 7.a) Find minimum cost spanning tree for the given graph using Fig. 7a. 10 4 3
- i) Prims Algorithm.
- ii) Kruskal's Algorithm.

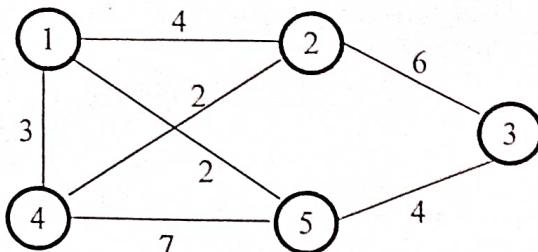


Fig: 7a

- b) Apply dynamic programming design technique to the following instance of the knapsack problem: $[w_1, w_2, w_3] = [1, 2, 2]$, $[p_1, p_2, p_3] = [20, 10, 15]$ and max capacity $M = 4$. Find the solution vector. 10 4 3

OR

- 8.a) Write an algorithm to find single source shortest path for the graph. Apply it on the given graph (Fig. 7a) from source vertex '4'. 10 4 3
- b) Find optimal solution for the following instance of the knapsack problem using memory function, : $[w_1, w_2, w_3] = [1, 2, 2]$, $[p_1, p_2, p_3] = [20, 10, 15]$ and max. capacity $M = 4$. Find the solution vector 10 4 3

- 9.a) What is back tracking? Give the problem statement for n-queens problem. Construct a state space tree for finding the solution to place 4 queens. 10 2 2
- b) Find the shortest path for the travelling salesman using branch and bound technique from the given data. 10 4 3

0 2 5 7
2 0 8 3
5 8 0 1
7 3 1 0

OR

- 10.a) Construct a state space tree to find the sum of subset from the set $S = \{1, 3, 5, 8\}$ where $d = 9$. 10 2 2
- b) Solve the following instance of assignment problem using branch and bound technique. 10 4 3

9 6 7 8
6 4 3 7
5 8 1 8
7 6 9 4

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

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.

- 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 $\frac{dy}{dx} = x^2 + y^2$, $y(0)=1$. M 6 CO 1 BL 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

- 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

- 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

- 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

- 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

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

SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY, TUMKUR.

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

B.E. SEMESTER END EXAMINATIONS – JULY 2022**CS4TH4 : Programming with Python****TIME: 3.00 Hrs****SEM: 4****MAX MARKS: 100****NOTE: Answer any five full questions selecting one full question from each choice.**

		M	CO	BL
1.a)	Explain the three types of errors that occur in a program with an example for each.	6	1	1
b)	What is the difference between / and // operators in python? Develop a python program to convert the given number of Seconds to Hours, Minutes and Seconds.	8	1	2
c)	Interpret the output of the following python statements: i) >>>int("23 bottles") ii) >>>"Hello" * 3 iii) >>> 2 ** 2 ** 3	6	2	2
	OR			
2.a)	Develop a Python program to compute and display the maturity amount for the deposit made in a bank by applying compound interest.	6	1	3
b)	Explain the working of the following functions with an example: i) type() ii) range() iii) len() iv) float()	8	2	2
c)	What is Collatz 3n+1 sequence? Develop a Python program that generates the sequence.	6	1	3
3.a)	Build Python functions for the following: i) To remove all the vowels from a string. ii) To count the number of times the letter 'a' appears in a string	6	2	3
6)	Develop a Python program with a user defined function to draw multi coloured squares of given size using turtle graphics.	8	2	3
c)	What are tuples? Develop a Python program to sort a list of tuples based on the sum of elements in each tuple.	6	3	3
	OR			
4.a)	Interpret the output of the following Python code snippets: i) fruit = "banana" print(list(enumerate(fruit))) ii) greeting = "Hello, world!" greeting[0] = 'J' print(greeting) iii) word = "banana" print(word[:3]) print(word[3:])	6	3	2
b)	Develop two Python functions that both generate ten million random numbers, and return the sum of the numbers with the following constraints: i) Function 1 builds a list of random numbers, and then sums them. ii) Function 2 sums up the random numbers as and when they are generated.	8	2	3
c)	Explain tuple assignment in terms of packing/ unpacking with an example? Build a Python function that returns both the area and circumference of a circle with given radius.	6	3	3
5.a)	Interpret the output of the following: i) a_list = ["a", "b", "c", "d", "e", "f"] a_list[1:3] = ["x", "y"] print(a_list) ii) a_list = ["a", "d", "f"] a_list[1:1] = ["b", "c"] print(a_list) iii) fruits = ["banana", "apple", "pear", "lemon"] for (i, v) in enumerate(fruits): print(i, v)	6	3	5

6)	Develop a Python program to copy non-comment lines from a source file to a destination file.	8	4	3
c)	Develop a Python program that groups a list of key-value pairs into a dictionary of lists.	6	4	3
	OR			
6.a)	Distinguish between the following concepts relating to List data structure:	6	3	4
	i) split() and join()			
	ii) append() and extend()			
b)	Develop Python code to perform the following operations on files:	8	4	3
	i) Reading a file one line at a time			
	ii) Reading the whole file at once			
c)	What are dictionaries? How are they created and accessed?	6	3	2
7.a)	Demonstrate the set operations union, intersection and difference with a suitable Python code snippet.	6	3	2
b)	What is a module? Develop Python code to create and access a user defined module.	8	4	3
c)	Illustrate the creation of NumPy arrays using the following methods: i) arrange() ii) random() iii) array()	6	2	2
	OR			
8.a)	What are the different ways of importing modules? Explain them with suitable Python code snippets.	6	2	2
b)	Develop a Python program to generate a list of n random integers without duplicates between a lower and an upper bound.	8	4	3
c)	Develop a Python program to store the names, ages and heights in meters of a group of people in three NumPy arrays, display the three arrays in the sorted order of their age.	6	4	3
9.a)	What is a Pandas Series? Demonstrate the process of creating and accessing a Pandas Series.	6	3	2
b)	Develop a Python program to create a Pandas DataFrame from a dictionary that shows the gender of each person and the team to which the person belongs. Summarize the data to show i) the distribution of genders in each team and ii) the distribution of teams for each gender.	8	4	3
c)	Develop a Python program to plot the monthly rainfall using a bar chart.	6	4	3
	OR			
10.a)	Explain the following operations on a Pandas DataFrame with an example for each: i) Sort by labels ii) Sort by values iii) Applying lambda function	6	3	2
b)	Develop a Python program to create a Pandas DataFrame from a Comma Separated Values file (.csv) consisting of Name, Score, Attempts and Qualified status of a group of students. Perform the following operations on the DataFrame: i) Display the details of first 3 students ii) Display the name and score of all the students iii) Display the details of qualified students iv) Display student details in decreasing order of their scores	8	4	3
c)	Write a Python code snippet to draw a Scatter plot.	6	3	2

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

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

CS4TH6 : SOFTWARE ENGINEERING

TIME: 3.00 Hrs

SEMESTER : IV

MAX MARKS: 100

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

- | | Marks | BL |
|--|--------------|-----------|
| 1.(a) Define Software Engineering. What are the essential attributes of good software? | 08 | 2 |
| b) With a neat diagram, Explain the requirement engineering process. | 08 | 2 |
| c) Explain any four ethical responsibility of a software engineer. | 04 | 2 |
| OR | | |
| 2.a) Define requirement specification. Explain the various ways of writing system requirements. | 08 | 2 |
| b) With a neat diagram, Explain the process of prototype development. | 08 | 2 |
| c) What are the fundamental activities of software? | 04 | 2 |
| OR | | |
| 3.a) With a neat diagram, Explain Ethnography and prototyping for Requirements analysis. | 10 | 2 |
| b) Explain the different types of checks that should be carried out on the requirements in the requirements document. | 10 | 2 |
| OR | | |
| 4.(a) List the Ways of writing a system requirements specification. Explain Natural language specification. | 10 | 2 |
| (b) List and Explain the Metrics for specifying non-functional requirements. | 06 | 2 |
| c) Explain the different checks to be carried out during requirement validation process. | 04 | 2 |
| OR | | |
| 5.a) Based on your experience with a bank ATM, Draw a data-flow diagram for modeling the data processing involved when a customer withdraws cash from the machine. | 10 | 2 |
| b) Model the data processing that might take place in Email System for both mail sending and mail receiving process separately. | 10 | 2 |
| OR | | |
| 6.a) What is a state machine model? Write the state diagram for a microwave oven with different states. | 10 | 2 |
| b) Explain an object oriented architectural model for an Invoice Processing System. | 10 | 2 |
| OR | | |
| 7.a) What is Agile Software Development? Explain the Advantages and Disadvantages of Agile Software Development. | 10 | 2 |
| b) With a neat diagram, explain the re-engineering process and essential conditions for software reengineering to be successful. | 10 | 2 |
| OR | | |
| 8.a) Explain the activities in re-engineering process and List the factors that affect the cost of system re-engineering. | 10 | 2 |
| b) Explain how the principles underlying agile methods lead to the accelerated development software. | 10 | 2 |

- Q.a)** Discuss the different types of Software Testing in software engineering 10 2
- b)** Explain the Software Risk Identification and Software Risk Analysis. 10 2
- OR**
- 10.a)** What is User Testing? What is the Significance of User Testing for Businesses? Explain Different Types of User Testing. 10 2
- b)** Explain the Risk Management Steps in Software Engineering 10 2

2	0	C	S	0	4	6
---	---	---	---	---	---	---

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

CS4TH5 : AUTOMATA THEORY AND COMPUTATION

TIME: 3.00 Hrs

SEM: IV

MAX MARKS: 100

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

- | | |
|--|--|
| 1.a) Obtain the regular expression to accept string of a's and b's whose second symbol from right end is a.
b) Obtain an ϵ NFA for the regular expression $a^*+b^*+c^*$
c) Give the statement of pumping lemma. Show that $L=\{a^n b^n n \geq 0\}$ is not regular | M CO BL
6 1 3
7 2 3
7 1 1 |
|--|--|
- OR**
- | | |
|---|-------------|
| 2.a) Construct the minimized DFA for the following: | 8 3 5 |
|---|-------------|

∂	0	1
$\rightarrow A$	B	A
B	A	C
C	D	B
*D	D	A
E	D	F
F	G	E
G	F	G
H	G	D

- | | |
|---|----------------------------|
| b) Define Regular Expression and obtain RE to accept strings of a's and b's having even length.
c) Construct an ϵ -NFA which accepts strings of a's and b's starting with the string ab | 6 2 1
6 3 5 |
|---|----------------------------|

- | | |
|--|-------------|
| 3.a) Define Leftmost derivation. Obtain the leftmost derivation for the string aaabbabbba using the following grammar
$S \rightarrow aB bA$
$A \rightarrow aS bAA a$
$B \rightarrow bS aBB b$ | 8 1 1 |
|--|-------------|
- | | |
|--|-------------|
| b) What is ambiguous grammar? Check the following grammar is ambiguous grammar or not.
$S \rightarrow aS X$
$X \rightarrow aX a$ | 7 2 1 |
|--|-------------|
- | | |
|--|-------------|
| c) Define context free Grammar with example. Obtain the grammar to generate strings consisting of any number of a's and b's. | 5 2 1 |
|--|-------------|

OR

- | | |
|---|-------------|
| 4.a) Differentiate ambiguous and unambiguous grammar. Obtain the grammar to generate the following language $L=\{ww^R \text{ where } w \in \{a,b\}^*\}$ | 7 2 4 |
|---|-------------|
- | | |
|---|-------------|
| b) Define derivation tree. Is the following grammar is ambiguous grammar or not
$S \rightarrow iCtS iCtSeS a$
$C \rightarrow b$ | 7 3 1 |
|---|-------------|
- | | |
|---|-------------|
| c) Explain briefly the applications of context free grammar | 6 2 2 |
|---|-------------|
- | | |
|--|--------------|
| 5.a) Construct the PDA to accept $L=\{a^n b^n n \geq 1\}$ by a final state . with example show that the string is accepted or rejected | 10 3 5 |
|--|--------------|

- b) Obtain the CFG for the PDA shown below and show all the resulting productions
 $\delta(q_0, a, Z) = (q_0, AZ)$
 $\delta(q_0, a, A) = (q_0, A)$
 $\delta(q_0, b, A) = (q_1, \epsilon)$
 $\delta(q_0, \epsilon, Z) = (q_2, \epsilon)$

OR

- 6.a) Obtain a CFG that generates the language accepted by PDA $M = (\{q_0, q_1\}, \{a, b\}, \{A, Z\}, \delta, q_0, Z, \{q_1\})$, with the transitions
 $\delta(q_0, a, Z) = (q_0, AZ)$
 $\delta(q_0, b, A) = (q_0, AA)$
 $\delta(q_0, a, A) = (q_1, \epsilon)$
- b) Construct a PDA to accept a string of balanced parentheses. The parentheses to be considered are (,),[], with example show that the string is accepted or rejected.
- c) Differentiate deterministic and non-deterministic PDA
- 7.a) Eliminate all ϵ -productions from the following grammar
- $S \rightarrow ABCa|bD$
 $A \rightarrow BC|b$
 $B \rightarrow b|\epsilon$
 $C \rightarrow c|\epsilon$
 $D \rightarrow d$
- b) Define the following
- i) left recursion
ii) Chomsky Normal form
- c) Design a Turing machine to accept the language $L = \{0^n 1^n | n \geq 1\}$ and draw the transition diagram.

OR

- 8.a) Eliminate all ϵ -productions from the following grammar
- $S \rightarrow BAAB$
 $A \rightarrow 0A2|2A0|\epsilon$
 $B \rightarrow AB|1B|\epsilon$
- b) Eliminate all unit productions from the following grammar
- $S \rightarrow A0|B$
 $B \rightarrow A|11$
 $A \rightarrow 0|12|B$
- c) Define Instantaneous Description in TM and Explain turing machine model.
- 9.a) Explain Decidable and undecidable problems in turing machines with example
- b) Write a note on halting problem of turing machine
- c) Explain post correspondence problem with example

OR

- 10.a) Explain church-turing thesis for several variations of turing machine
- b) Write a short note on the following
- i) Universal Turing machine
ii) post correspondence problem
- c) Illustrate the design and analysis of P and NP classes
