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MTECH
(SEM I) THEORY EXAMINATION 2024-25
FOUNDATION OF COMPUTER SCIENCE

TIME: 3 HRS

M.MARKS: 70

Note: Attempt all Sections. In case of any missing data; choose suitably.

SECTION A

1. Attempt all questions in brief.

2 x 07 = 14

Q no.	Question	CO	Level
a.	Write the syntax to create a node for a link list.		2
b.	Differentiate Binary search and Linear search.		3
c.	Differentiate paging and segmentation.		3
d.	Write down the difference between NPDA and DPDA with example.		3
e.	Design a FA to accept the binary number divisible by 3.		3
f.	Discuss the capabilities that should be provided by DBMS.		2
g.	Write down the difference between centralized and distributed databases.		3

SECTION B

2. Attempt any three of the following:

07 x 3 = 21

Q no.	Question	CO	Level																					
a.	Write a program in C to create a linear linked list interactively and print the list and total number of items in the list.		6																					
b.	Consider the processes , CPU burst time and arrival time given below: <table border="1" style="margin: 10px auto;"> <thead> <tr> <th>Process</th> <th>Arrival Time</th> <th>Burst Time</th> </tr> </thead> <tbody> <tr> <td>P₁</td> <td>0</td> <td>8</td> </tr> <tr> <td>P₂</td> <td>1</td> <td>4</td> </tr> <tr> <td>P₃</td> <td>2</td> <td>2</td> </tr> <tr> <td>P₄</td> <td>3</td> <td>1</td> </tr> <tr> <td>P₅</td> <td>4</td> <td>3</td> </tr> <tr> <td>P₆</td> <td>5</td> <td>2</td> </tr> </tbody> </table> Draw the Gantt Chart and calculate the following by using SRTF CPU scheduling algorithm: (i) Average Waiting Time (ii) Average Turn Around Time	Process	Arrival Time	Burst Time	P ₁	0	8	P ₂	1	4	P ₃	2	2	P ₄	3	1	P ₅	4	3	P ₆	5	2		3
Process	Arrival Time	Burst Time																						
P ₁	0	8																						
P ₂	1	4																						
P ₃	2	2																						
P ₄	3	1																						
P ₅	4	3																						
P ₆	5	2																						
c.	Define Push down automata. Design a PDA for the following language: $L = \{wcw^r \mid w = \{a, b\}^*\}$ where w^r is the reverse of w and c is the splitter.		6																					
d.	Construct a Turing Machine which accepts the following language: $L = \{0^n 1^n \mid n \geq 1\}$.		6																					
e.	Discuss about Normalization. Explain with suitable example about third, fourth and fifth Normal form.		2																					

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SECTION C

3. Attempt any one part of the following: 07 x 1 = 07

Q no.	Question	CO	Level
a.	Write an algorithm for Bubble Sort. Show step by step sorting procedure for the following list of elements: 54, 26, 93, 17, 77, 31, 44, 55, 20		4
b.	Discuss about stack. Write C functions to implement push and pop operations on stack.		6

4. Attempt any one part of the following: 07 x 1 = 07

Q no.	Question	CO	Level
a.	Explain the difference between Internal fragmentation and External fragmentation. Which one occurs in paging and which one occurs in pure segmentation, discuss about it.		4
b.	Discuss the performance criteria for CPU scheduling in detail.		2

5. Attempt any one part of the following: 07 x 1 = 07

Q no.	Question	CO	Level
a.	Discuss the applications and limitations of FA. Construct the DFA equivalent to the following regular expression: $(x+y)^*xy$		6
b.	Write CFG for the following languages: (i) $L = \{a^n b^m \mid n \leq m + 3, m, n \geq 0\}$. (ii) $L = \{a^{n+m} b^n \mid m, n \geq 1\}$		3

6. Attempt any one part of the following: 07 x 1 = 07

Q no.	Question	CO	Level
a.	Explain the commit protocol with reference to distributed database. How does the 2PC protocol respond to various types of failure.		2
b.	Discuss about transaction. How would you make transaction recovery from transaction failure, explain with suitable example.		2

7. Attempt any one part of the following: 07 x 1 = 07

Q no.	Question	CO	Level
a.	Design the PDA for the following grammar: $S \rightarrow aA, A \rightarrow aABC bB a, B \rightarrow b, C \rightarrow c$		6
b.	Explain three-tier architecture of database system.		2