Paper / Subject Code: 31921 / Theoretical Computer Science

(3 hours)   [80 marks]

NOTE:
1. Question No 1 is compulsory
2. Attempt any three questions from remaining.
3. Assume suitable data if necessary and state the same.

Q1.   [20]
a) Show that grammar represented by production rules given below is ambiguous.
   $S \rightarrow S + S \mid S - S \mid S * S \mid S/S \mid (S) \mid a$
b) Construct a Moore machine to output remainder modulo 4 for any binary number.
c) Differentiate between NPDA and PDA.
d) Explain Chomsky Hierarchy.

Q2.
a) Write steps for converting CFG to CNF form. Convert the following CFG to CNF. [10]
   $S \rightarrow ASB \mid \epsilon \quad A \rightarrow aAS \mid a \quad B \rightarrow SbS \mid A \mid bb$
b) Convert following RE to NFA-ϵ and convert it to minimised DFA corresponding to it
   $(0+11)*(10)(11+0)*$ [10]

Q3.
a) Construct a PDA for accepting $L = \{a^n b^m c^n \mid m,n >= 1\}$ [10]
b) Give formal Definition of Pumping Lemma for Regular Language. Prove that the
   following language is not regular. $L = \{wrw^r \mid w \in \{a,b\}^*, r \in \{c\}, |w| >= 1\}$ [10]

Q4.
a) Construct CFG for following
   i. Alternate sequence of 0 and 1 starting with 0   [03]
   ii. Do not contain 3 consecutive a over {a,b}   [04]
   iii. $L=\{x \in \{0,1\}^* \mid x$ has equal number of 0's and 1's$\}$ [03]

b) Explain applications for FA, PDA and TM   [10]

Q5.
a) Construct a Moore machine to convert all occurrences of 100 to 101 in a string over
   $\{0,1\}^*$. convert it to equivalent Mealy Machine   [10]
b) Design a TM accepting all palindromes over $\{0,1\}$ [10]

Q6. Write short note (Solve Any 4)   [20]
a) Decision Properties of Regular Languages
b) Post Correspondence Problem
c) Variants of Turing Machine
d) Acceptance by a PDA
e) Conversion of Moore to Mealy Machines
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(3 Hours)   [Total Marks: 80]

Note: (1) Question 1 is compulsory
       (2) Solve any three questions out of remaining
       (3) Assume suitable data wherever necessary

Q.1		Solve any four	[20]
	(a)	Explain principle differences between connection less and connection oriented communication.	
	(b)	What is channel allocation problem?	
	(c)	Find the error, if any, in the following IPv4 addresses. (i) 221.24.7.8.20 (ii) 75.45.351.14	
	(d)	Differentiate between TCP and UDP.	
	(e)	Write short note on SMTP.	
Q.2	(a)	Describe OSI reference model with a neat diagram.	[10]
	(b)	Explain different framing methods.	[10]
Q.3	(a)	Explain different types of guided transmission media in detail.	[10]
	(b)	Explain sliding window protocol using selective repeat technique.	[10]
Q.4	(a)	Explain Link State Routing with suitable example.	[10]
	(b)	What is need of DNS and explain how DNS works?	[10]
Q.5	(a)	Explain IPv4 header format in detail.	[10]
	(b)	Explain Three Way Handshake Technique in TCP.	[10]
Q.6	(a)	Explain leaky bucket algorithm and compare it with token bucket algorithm.	[10]
	(b)	Write short notes on: (i) TCP Timers (ii) HTTP	[10]

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Question 5   10 marks each

A   Explain multilevel and multidimensional association rule mining in detail.

B   A database has five transactions. Let minimum support count = 2 and minimum confidence =60 %. Find all frequent item sets using Apriori Algorithm. List strong association rules.

TID	Items
100	1,3,4
200	2,3,5
300	1,2,3,5
400	2,5
500	1,3,5

Question 6   10 marks each

A   Explain K-Means clustering algorithm. Discuss its advantages and limitations. Apply K-Means algorithm for the following data set with 3 clusters.

Data Set={2,3,6,8,9,12,15,18,22}

B   Consider the data given below. Create adjacency matrix. Apply complete link algorithm to cluster the given data set and draw the dendogram.

	A	B	C	D	E
A	0	2	6	10	9
B	2	0	3	9	8
C	6	3	0	7	5
D	10	9	7	0	4
E	9	8	5	4	0

Time: 3 hours

Max. Marks: 80

Note: 1. Question no.1 is compulsory.
2. Attempt any three out of remaining five.
3. Assumptions made should be clearly indicated.
4. Figures to the right indicates full marks.
5. Assume suitable data whenever necessary.

Question 1 Solve any four. 5 marks each

A What are the basic building blocks of Data warehouse?

B Explain Page Rank technique in detail.

C Compare OLTP and OLAP.

D Differentiate between Agglomerative and Divisive clustering method.

E Discuss data visualization Technique.

F Explain issues in Data mining.

Question 2 10 marks each

A Explain Decision Tree based Classification Approach with example. Discuss Metrics for evaluating Classifier Performance.

B Describe the steps involved in Data Mining when viewed as a process of Knowledge Discovery.

Question 3 10 marks each

A Differentiate between Star schema and Snowflake schema. Design Star schema for company sales with three dimensions such as Location, Item and Time.

B Explain Data Pre-processing.

Question 4 10 marks each

A Differentiate between top-down and bottom-up approaches for building data warehouse. Discuss the merits and limitations of each approach. Also explain the practical approach for designing a data warehouse.

B What is Web mining? Explain Web structure Mining and Web Usage Mining in detail.

Duration: 3hrs   [Max Marks:80]

N.B. : (1) Question No 1 is Compulsory.
       (2) Attempt any three questions out of the remaining five.
       (3) All questions carry equal marks.
       (4) Assume suitable data, if required and state it clearly.

1   **Attempt any FOUR**   [20]
   a   Explain how JavaScript can hide HTML Elements with suitable example.
   b   If you wanted to send sensitive information like password to the backend which
       among the GET and the POST method in PHP would you use, justify your
       answer and distinguish between these methods.
   c   Write a code in React js to display "Hello World".
   d   Write a code to Drag an image from outside the box and Drop it inside the box
   e   What are cookies? And how do cookies work in servlets?

2   a Create an external Stylesheet and link it to an HTML form, the stylesheet should   [10]
       contain the following,
          i.   An header in text with Red Text Colour and Yellow background colour
          ii.   A Double lined (Border) table
          iii. The table should have 5 Rows and 3 Columns
          iv.   In the First column Sr. No. of the product, Second Column Image with
                hyperlink and Name of the Product, and Third Column the description of
                the product
    b Create a form which has the following fields 'Name', 'Age', 'Email ID',   [10]
       'Password'. Using Javascript validate each field as follows
          i.   Name should be between A-Z
          ii.   Age should be between 0-100
          iii. Email ID should contain '@'
          iv.   Password should contain 1 Upper case, 1 Digit, 1 Special character and
                length should be minimum 8

3   a Explain how form validation works in PHP, with a suitable example   [10]
    b Explain Basic Internet Protocols which are essential for transferring data and   [10]
       sending emails.

4   a Write the AJAX code to read from the text file and displaying it after clicking of   [10]
       a button.
    b List and Explain the 3 ways to add style sheet (CSS) to an HTML web page with   [10]
       suitable examples.

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5 a Draw and explain Servlet Architecture and its Lifecycle.   [10]

   b An e-commerce website would like to accept the below mentioned data and   [10]
     would like to transfer the data using XML,

       i.   Product ID
       ii.   Product Name
       iii.   Product Cost
       iv.   Purchase Date
       v.   Purchased by
       vi.   Seller Name

     Write the HTML, XML code and DTD for the given data.

6 a Write a JSP Program to perform four basic arithmetic operations, Addition,   [10]
     Subtraction, Division and Multiplication.

   b Explain Exception handling in Javascript with suitable example.   [10]

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