TE/CMPN/SEM-V/C-2019/NOV.2023

Duration: 3 hrs **[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 **[20]**

a Differentiate Finite Automata, Push Down Automata and Turing Machine.

b Discuss different applications of Finite Automata

c Design DFA that accepts Strings with at least 3 a's. over $\sum=\{a,b\}$.

d Simplify the given grammar

$S \rightarrow ASB \mid \epsilon$
$A \rightarrow aAS \mid a$
$B \rightarrow SbS \mid A \mid bb$

2 a Compare and Contrast Moore and Mealy Machines. Design Moore machine for $\sum=\{0,1\}$, print the residue modulo 3 for binary numbers. **[10]**

b Design Push Down Machine that accepts $L = \{a^m b^n c^n d^m \mid m, n>0\}$ **[10]**

3 a i) Construct CFG for given language. $L = \{ 0^i 1^j 0^k \mid j>i+k\}$ **[10]**
ii) The grammar G is $S \rightarrow aB \mid bA$ $A \rightarrow a \mid aS \mid bAA$ $B \rightarrow b \mid bS \mid aBB$
Obtain parse tree for the following string "aababb" and check if the grammar is ambiguous.

b Explain Pumping Lemma with the help of a diagram to prove that given language is not a regular language. $L=\{0^m 1^{m+1} \mid m>0\}$ **[10]**

4 a i) Design DFA that accepts Strings that ends in either "110" or "101" over $\sum=\{0,1\}$. **[10]**
ii) Design NFA that accepts strings starting with "abb" or "bba"

b Given NFA with epsilon, Find equivalent DFA. q1 is the initial state, q3 is final state **[10]**

	0	1	2	ϵ
→q1	{q1}	-	-	{q2 }
q2	-	{q2}	-	{ q3}
*q3	-	-	{ q3}	-

5 a Find Equivalent Greibach Normal Form (GNF) for given CFG. **[10]**

$S \rightarrow AA \mid a$
$A \rightarrow SS \mid b$

b Define and design Turing Machine to accept $0^n 1^n 2^n$ over $\sum=\{0,1,2\}$. **[10]**

6 Write Short notes **(Any Two)** **[20]**

a Explain with example Chomsky Hierarchy.

b Post Correspondence Problem.

c Recursive and Recursive enumerable languages.

d TM-Halting Problem.

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Time: 3 Hours **Marks : 80**

N.B. (1) Question one is Compulsory.
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Q. 1 Solve any Four out of the following (5 marks each) 20M

a) Explain Scrum Methodology with suitable diagram.

b) Write short note on FTR

c) Explain Project Tracking

d) Write a short note on UML diagrams

e) How risk analysis is important in project, can it harm budgets or project deployment status?

Q. 2 a) Design the test cases for Medical Management Application 10M

b) Explain COCOMO model in detail 10M

Q.3 a) Write an SRS for University Management Website 10M

b) Design the DFD for Library Management System 10M

Q.4 a) How User Interface Design helps web technology or IT Industry? 10M

b) What are different metrics used for software measurement? Explain function Point-based estimation technique in detail 10M

Q5 a) List out different software testing strategies? Compare White box testing & Black box testing 10M

b) What are different categories of risks? Explain RMMM plan with suitable example 10M

Q6 a) Explain Cohesion & Coupling? Explain different types of cohesion 10M

b) Explain SQA in detail. 10M

[Time: 3 Hours] [Marks:80]

N.B

(1) Question no. 1 is compulsory.

(2) Attempt any 3 from the remaining questions.

(3) Assume suitable data if necessary.

(4) Figures to right indicate full marks.

			Marks
Q.1		**Attempt any four of the following**	
	a)	What is subnetting? Compare subnetting and supernetting	[5]
	b)	What are three reasons for using layered protocols? What is two possible disadvantages of using layered protocols?	[5]
	c)	Explain the count to infinity problem in detail.	[5]
	d)	List two ways in which the OSI reference model and the TCP/IP reference model are the same. Now list two ways in which they differ.	[5]
	e)	4-bit data bits with binary value 1010 is to be encoded using even parity Hamming code. What is the binary value after encoding?	[5]
Q.2		**Attempt the following**	
	a)	Define guided transmission media? Illustrate with diagram the details for coaxial cable? State any 5 comparative characteristics of coaxial cable with fiber optics and twisted pair cables.	[10]
	b)	Explain how collision handled in CSMA/CD? A 5 km long broadcast LAN uses CSMA has 10^7 bps bandwidth and uses CSMA/CD. The signal travels along the wire at 5×10^8 m/s. What is the minimum packet size that can be used on this network?	[10]
Q.3		**Attempt the following**	
	a)	An organization has granted a block of addresses starting with 105.8.71.0/24, organization wanted to distribute this block to 11 subnets as follows 1. First Group has 3 medium size businesses, each need 16 addresses 2. The second Group has 4 medium size businesses, each need 32 addresses. 3. The third Group has 4 households, each need 4 addresses. Design the sub blocks and give slash notation for each subblock. Find how many addresses have been left after this allocation.	[10]
	b)	Explain classful IP addressing scheme in detail? List the advantages and disadvantages of classless IP addressing scheme.	[10]

Q.4 **Attempt the following**

a) Explain the open loop congestion control and closed loop congestion control policies in detail [10]

b) Explain the TCP connection establishment and Connection release. [10]

Q.5 **Attempt the following**

a) Explain the concept of sliding protocol? Explain the selective repeat protocol with example? Compare the performance of Selective repeat & Go-back-N protocol. [10]

b) Explain the link state routing algorithm with example? [10]

Q.6 **Write a short note on following**

a) ARP & RARP [10]

b) DNS [10]

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Duration:(3 Hours) *[80 Marks]*

N.B. 1) Question No. 1 is compulsory.
2) Attempt any Three questions out of the remaining.
3) Assume suitable data wherever necessary and state them clearly.

Q.1 Solve any four of the following (20)

A. Compare OLTP vs OLAP systems.
B. Explain the KDD process of data mining.
C. Explain any two methods of evaluating the accuracy of a Classifier.
D. Explain K-means clustering algorithm and draw flowchart.
E. Explain multilevel association rule mining with example.
F. Write a short note on web usage mining.

Q.2 A. Consider the following transaction database with minimum support 50% and minimum confidence 66%. Find the frequent patterns and strong association rules. (10)

Tid	Items
10	A,C,D
20	B,C,E
30	A,B,C,E
40	B,E

Q.2 B. Explain different steps involved in data preprocessing. (10)

Q.3 A. Find the clusters for the following dataset using a single link technique. Use Euclidean distance and draw the dendrogram. (10)

Sample No	X	Y
P1	0.40	0.53
P2	0.22	0.38
P3	0.35	0.32
P4	0.26	0.19
P5	0.08	0.41
P6	0.45	0.30

Q.3.B. The college wants to record the Marks for the courses completed by students using the dimensions: I) Course, II)Student, III) Time & a measure Aggregate marks .
Create a cube and describe following OLAP operations :
I) Slice II) Dice III) Roll up IV) Drill Down V)Pivot (10)

Q.4.A. What is dimensional modeling? Design the data warehouse dimensional model for a wholesale furniture Company. The data warehouse has to analyze the company's situation at least with respect to the Furniture, Customer and Time. Moreover, the company needs to analyze: The furniture with respect to its type, category and material. The customer with respect to their spatial location, by considering at least cities, regions and states. The company is interested in learning the quantity, income and discount of its sales.. (10)

Q.4 B. A data sample is given below. Find whether Patient X has flu or not using Naïve Bayes classifier.

If X= (chills=Y, runny nose=N, headache=Mild, fever=Y, flu=?) (10)

chills	Runny nose	headache	fever	Flu
Y	N	Mild	Y	N
Y	Y	No	N	Y
Y	N	Strong	Y	Y
N	Y	Mild	Y	Y
N	N	No	N	N
N	Y	Strong	Y	Y
N	Y	Strong	N	N
|Y	Y	Mild	|Y	Y

Q.5 A.Explain Page Rank algorithm with example. (10)
B. Explain different data visualization techniques. (10)

Q.6. Write short notes on following: (20)
A. Applications of Data Mining.
B. FP Tree
C. Web content Mining
D. Techniques of data Loading

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[TIME: 3 Hrs] [Marks:80]

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1 **Attempt any FOUR (5 marks)** [20]

a Explain Gibbs Distribution with the help of an example.
b Explain Markov Models with the help of any one application of the same.
c Discuss how HMM can be used for speech recognition.
d Differentiate between marginal and joint distributions with an example.
e Discuss how I Maps can be used to illustrate independencies.

2 a Explain the role of the Viterbi algorithm in Hidden Markov Model decoding with the help of an example. [10]

b There is a Mouse moving around a maze. The maze is a closed space containing nine rooms numbered from 1 to 9 and there are doorways connecting the rooms. [10]

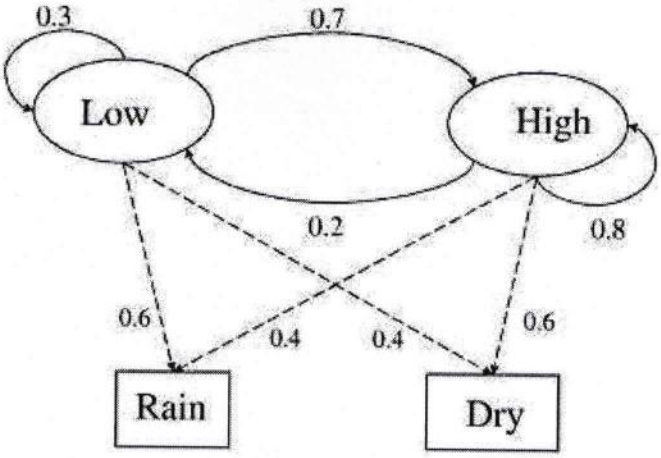
There are doors leading to adjacent rooms, i.e. there are doors :

1. from 1 to 2, 4
2. from 2 to 1, 3, 5
3. from 3 to 2, 6
4. from 4 to 1, 5, 7
5. from 5 to 2, 4, 6, 8
6. from 6 to 3, 5, 9
7. from 7 to 4, 8
8. from 8 to 5, 7, 9
9. from 9 to 6,8

a. Generate Transition Matrix based on above information.
b. What is the probability of the mouse starting from room 2 and reaching room 2 again in two transitions ?

3 a Explain Plate model with the help of an example [10]
b What is a maximal clique? How can we represent parameterization using cliques. [10]

4 a Calculate the probability of a sequence of observations, i.e., {Dry, Rain} for following HMM. Consider initial probabilities P(Low)=0.4 and P(High)=0.6 [10]

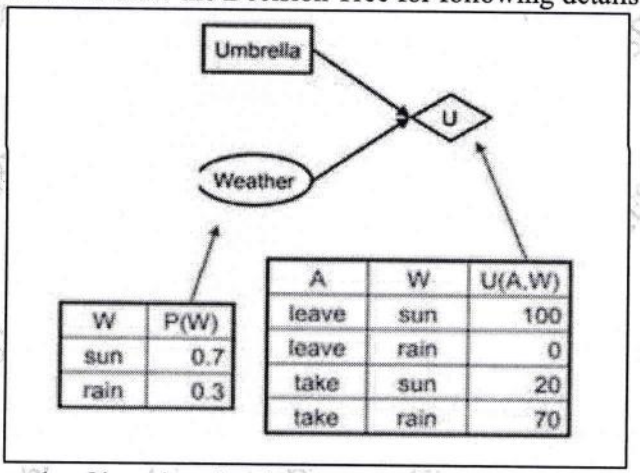


b Explain Reduced Markov Model with the help of an example. [10]

5 a Explain any one application of Markov Networks. [10]

b Explain Decision Networks with all associated terminologies? [10]

Anisha wants to go out but based upon rainy or sunny conditions she will decide whether to take an umbrella with her or leave at home. The various probabilities are given in the graph below. Calculate Maximum Expected Utility using Bayesian Network and draw the Decision Tree for following details:



W	P(W)
sun	0.7
rain	0.3

A	W	U(A,W)
leave	sun	100
leave	rain	0
take	sun	20
take	rain	70

6 a Explain three goals of learning Graphical Models. [10]

b Discuss concept of Log Linear Parameterization with the help of an example. [10]