

e.	If a random sample of size $n = 20$ from a normal population with variance $\sigma^2 = 225$ has the mean $\bar{x} = 64.3$, construct a 95% confidence interval for the population mean μ .	1	2
f.	With standard notations if $S_{xy} = 520.40$, $S_{xx} = 148,000$, $S_{yy} = 7.13745$, $\sum_{i=1}^n x_i = 2,150$, $\sum_{i=1}^n y_i = 10.35$ and $n = 10$. Fit a straight line and use it to find the value of dependent variable when independent variable is 180.	2	2
g.	A trucking firm is suspicious of the claim that the average lifetime of certain tires is at least 28,000 miles. To check the claim, the firm puts 40 of these tires on its trucks and gets a mean lifetime of 27,463 miles with a standard deviation of 1,348 miles. What can it conclude if the probability of Type I error is to be 0.01.	5	2

Q.3. Attempt any three out of four.

(3×10=30)

a.	(i) A businessman goes to hotels X, Y, Z 20%, 50%, 30% of the time, respectively. It is known that 5%, 4%, 8% of the rooms in X, Y, Z hotels have faulty plumbing. (5) (1) Determine the probability that the businessman goes to hotel with faulty plumbing; (2) What is the probability that businessman's room having faulty plumbing is assigned to hotel Z. (ii) A coin is tossed three times, all the outcomes being equally likely. If A is the event that a head occurs on each of the first two tosses, B is the event that a tail occurs on the third toss, and C is the event that exactly two tails occur in the three tosses then check whether events A and B are independent, (5) 1. whether events B and C are independent.	2	2
b.	(i) A random variable has a normal distribution with $\sigma = 10$. If the probability is 0.8212 that it will take on a value less than 82.5, what is the probability that it will take on a value greater than 58.3. (5) (ii) If the distribution function of a random variable is given by (5) $F(x) = \begin{cases} 1 - \frac{4}{x^2}, & x > 2 \\ 0, & x \leq 2 \end{cases}$ Find the corresponding density function and hence find the probabilities that this random variable will take on a value (i) less than 3; (ii) between 4 and 5	2	2
c.	For the simple linear regression calculate the following for the given data a. the estimates of slope b. the estimates of intercept $\sum_{i=1}^n x_i = 43$, $\sum_{i=1}^n y_i = 572$, $\sum_{i=1}^n x_i^2 = 157.42$, $\sum_{i=1}^n y_i^2 = 23530$, $\sum_{i=1}^n x_i y_i = 1697.80$ and $n = 14$.	3	2
d.	The specification for a certain kind of ribbon call for a mean breaking strength of 14 pounds. If five pieces randomly selected from different rolls have breaking strength of 14.5, 14.2, 14.4, 14.3, and 14.6 pounds test the null hypothesis $\mu = 14$ pounds against the alternative hypothesis $\mu \neq 14$ pounds at the 0.05 level of significance.	2	2

..3/-

Attempt any two out of three.

(2×15=30)

(2×15=30)																																	
a.	(i) From a box containing 3 blue, 2 red, and 4 green marbles, two marbles are selected at random. (1) Find the joint probability distribution of X_1 = the number of blue marbles, and X_2 = the number of red marbles. (2) Find the marginal probability distribution of X_1 . (3) Find the conditional probability distribution X_1 given $X_2 = 0$. (9) (ii) A manufacturer of submersible pumps claims that at most 40% of the pumps require repairs within first 5 years of operation. If a random sample of 150 of these pumps include 49 which require repairs within the first 5 years, test the null hypothesis $p = 0.40$ against the alternative hypothesis $p < 0.40$ at the 0.01 level of significance. (6)									2	2																						
b.	(i) The t distribution with 1 degree of freedom is given by $f(t) = \frac{1}{\pi} (1 + t^2)^{-1}, -\infty < t < \infty.$ Verify the value given for $t_{0.05}$ for $\nu = 1$. (6) (ii) Find the distribution function of a continuous random variable X whose probability density is given by (9) $f(x) = \left\{ \begin{array}{ll} \frac{x}{2} & \text{for } 0 < x \leq 1 \\ \frac{1}{2} & \text{for } 1 < x \leq 2 \\ \frac{3-x}{2} & \text{for } 2 < x < 3 \\ 0 & \text{elsewhere} \end{array} \right\}$ Also use distribution function to find the probabilities that a random variable will take on a value (I) greater than 2.5, (II) between 0.5 and 1.9.									2	2																						
c.	(i) Twelve randomly selected trees of one variety have a mean height of 13.8 feet with a standard deviation of 1.2 feet, and 15 randomly selected trees of another variety have mean height of 12.9 feet with a standard deviation of 1.5 feet. Assuming that the samples were selected from normal populations with equal variances, construct a 95% confidence interval for the difference between the true average height of the two kinds of trees. (7) (ii) Fit a simple linear regression model to the following data taking x as independent and y as dependent variable (8) <table><tr><td>x</td><td>20</td><td>60</td><td>100</td><td>140</td><td>180</td><td>220</td><td>260</td><td>300</td><td>340</td><td>380</td></tr><tr><td>y</td><td>0.18</td><td>0.37</td><td>0.35</td><td>0.78</td><td>0.56</td><td>0.75</td><td>1.18</td><td>1.36</td><td>1.17</td><td>1.65</td></tr></table>									x	20	60	100	140	180	220	260	300	340	380	y	0.18	0.37	0.35	0.78	0.56	0.75	1.18	1.36	1.17	1.65	3	2
x	20	60	100	140	180	220	260	300	340	380																							
y	0.18	0.37	0.35	0.78	0.56	0.75	1.18	1.36	1.17	1.65																							
										5	1																						

END SEMESTER EXAMINATION, JUNE- 2025**B. Tech. (CSE) Semester - IV****Course Name: Design and Analysis of Algorithm****Course Code: CS403T**

Time allotted: 03 Hours

Max. Marks: 100

Note: Read all the instructions carefully.

Q.1. Attempt all.**(10×2=20)**

	CO	PO
a. Define complexity.	1	1
b. Explain principle of optimality.	3	1
c. Write of time complexity of quick sort in best-case, average-case, and worst-case.	2	1
d. Define recursive algorithm.	2	2
e. Mention the limitations of binary search.	1	1
f. Apply quicksort to sort the list: E, X, A, M, P, L, E in alphabetical order.	1	1
g. Prove that if $f(n) = a_m n^m + \dots + a_1 n + a_0$, then $f(n) = O(n^m)$.	1	2
h. Explain Tries.	5	1
i. Define Suffix tree.	5	1
j. Explain Cook's theorem.	5	2

Q.2. Short notes / Short Answer Type (Attempt any five out of Seven)**(5×4=20)**

a. Explain optimal merge patterns with a suitable example.	3	1
b. Explain and solve 4-Queens problem.	4	2
c. Given $\{f_1, f_2, f_3, \dots\}$ is an finite family of functions such that each function f_k is a function from natural numbers to natural numbers such that $f_k(n) = O(n)$. Prove that, $\sum_{i=1}^n f_i(n) = O(n^2)$.	1	1
d. Explain single -source shortest path problem.	3	1
e. Discuss about spanning tree with a suitable example.	3	2
f. Differentiate between DFS and BFS.	1	1
g. Find an optimal solution of Knapsack problem using dynamic programming technique. $N = 3, W = 4, \text{profit} [] = \{1, 2, 3\}, \text{weight} [] = \{4, 5, 1\}$	3	1

P.T.O/-

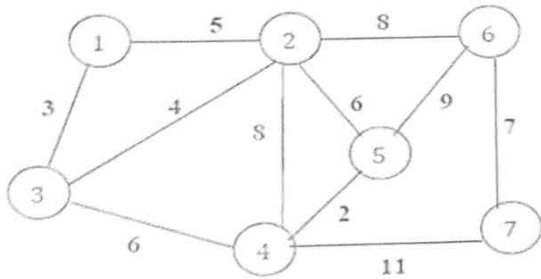
Q.3. Structured Question (Attempt any three out of four)

(3×10=30)

a.	(i) Explain single -source shortest path problem (ii) Write and explain Dijkstra Algorithm.	3	
b.	(i) Solve travelling sales person problem using Least-Cost Branch and Bound Technique. (ii) Explain Least-Cost Branch and Bound Technique.	4	2
c.	(i) Write and explain string matching algorithm. (ii) Write Rabin-Karp string matching algorithm.	5	1
d.	(i) Explain Divide-and -Conquer technique. (ii) Explain Optimal Binary Search tree with an example.	2	1

Q.4. Long Answer / Essay type (Attempt any two out of three)

(2×15=30)

a. Solve the following recurrences-		1	2																					
(i) $T(n) = T(n-1) + n^4$																								
(ii) $T(n) = 4T(n/3) + n^2$																								
(iii) $T(n) = 2T(n/2) + \sqrt{n}$																								
b. Given the jobs, their deadlines and associated profits as shown-		2	1																					
<table><tr><td>Jobs</td><td>J1</td><td>J2</td><td>J3</td><td>J4</td><td>J5</td><td>J6</td></tr><tr><td>Deadlines</td><td>5</td><td>3</td><td>3</td><td>2</td><td>4</td><td>2</td></tr><tr><td>Profits</td><td>200</td><td>180</td><td>190</td><td>300</td><td>120</td><td>100</td></tr></table>		Jobs	J1	J2	J3	J4	J5	J6	Deadlines	5	3	3	2	4	2	Profits	200	180	190	300	120	100		
Jobs	J1	J2	J3	J4	J5	J6																		
Deadlines	5	3	3	2	4	2																		
Profits	200	180	190	300	120	100																		
Answer the following questions-																								
(i) Write the optimal schedule that gives maximum profit.																								
(ii) Are all the jobs completed in the optimal schedule?																								
(iii) What is the maximum earned profit?																								
c. Compute a minimum cost spanning tree for a given graph in Figure 2 using-		4	2																					
(i) Prim's algorithm																								
(ii) Kruskal's algorithm																								
																								
Figure 2. Weighted graph																								

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END SEMESTER EXAMINATION, JUNE- 2025
B. Tech. (CSE) Semester - IV

Course Name: Formal Language & Automata Theory**Course Code: CS405T****Time allotted: 03 Hours****Max. Marks: 100****Note: Read all the instructions carefully.**

Q.1. Objectives Type (Very short/ Short Answer, MCQ, One-liners, Fill in the Blank, True/ False)
Attempt all. **(10×2=20)**

		CO	PO
a.	Define: (i) Finite Automaton (FA)	1	1,2
b.	What are the applications of automata theory?	1	1,2
c.	What is a regular expression?	1	2
d.	Differentiate L^* and L^+	1	1
e.	What are the applications of Context free languages?	1	1
f.	What is a ambiguous grammar?	1	1,2
g.	What are the components of PDA ?	1	1,2
h.	What is a Turing machine?	1	1,2
i.	When we say a problem is decidable?	1	2
j.	What properties of recursive enumerable seta are not decidable?	1	2

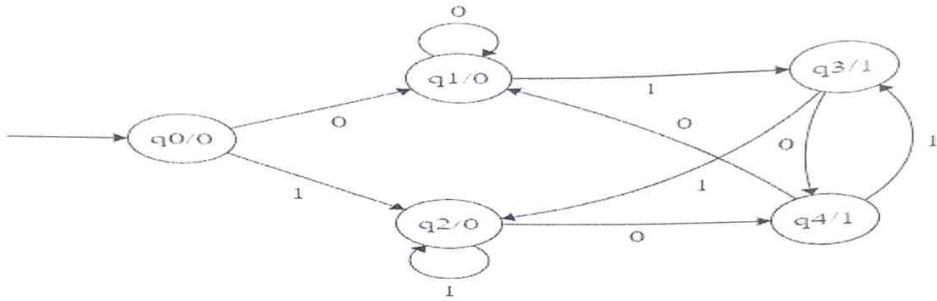
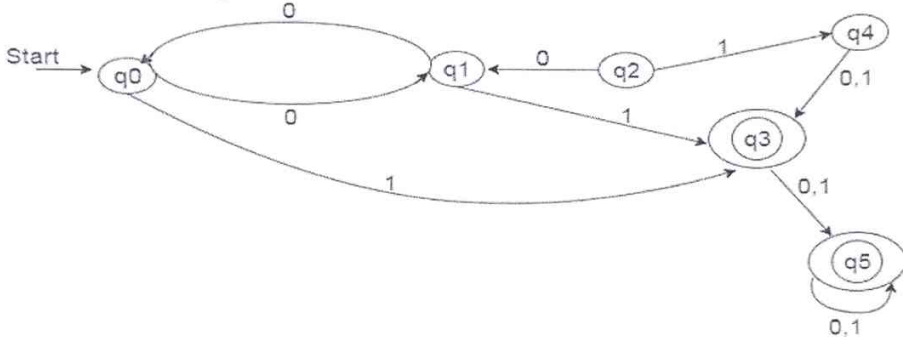
Q.2. Short notes / Short Answer Type (Attempt any five out of Seven)**(5×4=20)**

		CO	PO
a.	Define P and NP classes.	2	2,3
b.	Construct a regular grammar for $L=\{0^n11 \mid n \geq 1\}$.	2	2
c.	What are state diagram and state transition table?	2	1,2
d.	Construct an NFA accepting the set of all strings over $\{0,1\}$ whose second symbol from last is 1.	2	2,3
e.	Give the formal definition of Moore machine.	2	1,2
f.	Write about the model of Push Down Automata and context free grammar.	2	2
g.	Construct Turing Machine for multiplication of two unary numbers.	2	1

P.T.O./-

Q.3. Structured Question (Attempt any three out of four)

(3×10=30)

		CO	PO
a.	What is Simplification of CFG? What the problems unit production create in CFG? Remove unit production from the following grammar: $S \rightarrow AB$, $A \rightarrow E$, $B \rightarrow C$, $C \rightarrow D$, $D \rightarrow b$, $E \rightarrow a$	3	2
b.	Convert Moore to Mealy Machine	3	2
			
c.	Minimize the DFA given below:	3	1,2
			
d.	Convert the following grammar into Greibach normal form. $S \rightarrow AA/a$ $A \rightarrow SS/b$	3	1,2

Q.4. Long Answer / Essay type (Attempt any two out of three)

(2×15=30)

		CO	PO
a.	i. With an example, explain the procedure to simplify a CFG. ii. What is normalization of a Grammar? Define CNF and GNF. What is the difference between these two normal forms?	4	1,2
b.	i. State and explain Arden's Theorem. ii. From the identities of Regular Expression prove that: $(1+100^*) + (1+100^*)(0+10^*)(0+10^*) = 10^*(0+10^*)$	4	1,2
c.	i. Construct the left-most and right-most derivations and parse trees for the following grammar: $S \rightarrow aB \mid bA$ $A \rightarrow aS \mid bAA \mid a$ $B \rightarrow bS \mid aBB \mid b$ Which accepts the string "aaabbabbba". ii. Construct a DFA for the Regular Language consisting of any number of a's and b's.	4	2,5

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END SEMESTER EXAMINATION, JUNE- 2025**B. Tech. (Hons.) CSE in AI & ML Semester - IV****Course Name: Natural Language Processing****Course Code: PCT413**

Time allotted: 03 Hours

Max. Marks: 100

Note: Read all the instructions carefully.

Q.1. Attempt all.**(10×2=20)**

QN	Questions	CO	PO
a.	NLU stands for....	2	1
b.	NLG stands for..	3	2
c.	The top-down parsing approach begins from the _____ symbol	2	1
d.	GPT stands for.....	2	1
e.	BERT stands for.....	3	2
f.	Define NLP.	3	1
g.	CIRCSIM-Tutor is an example of an intelligent tutoring system. True/False	5	2
h.	POS tagging is a part of lexical analysis. True/False	2	1
i.	Top-down parsers build parse trees from leaves to root. True/False	3	1
j.	CDS stands for Clinical Decision Support. True/False	5	2

Q.2. Attempt any five out of Seven.**(5×4=20)**

a.	What is Natural Language Processing? Explain its significance.	3	2
b.	Define AutoTutor. Explain the architecture and process of AutoTutor.	2	1
c.	Discuss the major challenges in NLP. What are the different levels of NLP processing?	2	1
d.	What is an N-GRAM model? How is it used in language processing?	3	2
e.	Explain the Hidden Markov Model (HMM) and its applications in NLP.	3	2
f.	How is bottom-up parsing different from top-down parsing?	2	1
g.	Explain some key applications of NLP in real-world systems.	2	1

Q.3. Attempt any three out of four.**(3×10=30)**

a.	Define Natural Language Processing (NLP)? Discuss the major challenges in NLP. Explain the different levels(steps) of NLP processing using diagram. Explain LLM and list out any two widely used LLM models.	1	1
b.	What is WHY2-ATLAS? What is the architecture and working process of WHY2-ATLAS? Explain the major applications of NLP in healthcare. What role of NLP in Clinical Decision Support System?	5	2
c.	Explain the linguistics, and why is it important in NLP? Explain the POS tagging with example. Explain the Hidden Markov Model (HMM) and its applications in NLP.	3	1
d.	Define text similarity. What are the different methods of text similarity? Explain the Jaccard similarity, K-means clustering, cosine similarity methods used in NLP	4	1

Q.4. Attempt any two out of three.**(2×15=30)**

a.	Explain the following: 1. Corpus creation 2. Word Embedding (CBOW and Skip-Gram) 3. Naïve Bayes algorithm 4. Bag of Words metrics with suitable example. 5. N-gram model and NLTK	2	1
b.	Explain the different approaches to NLP. Explain TF-IDF. Calculate the TF-IDF values for the terms "cat" and "dog" in following documents (corpus). 1. Document 1: "The cat sat on the mat." 2. Document 2: "The dog played in the park." 3. Document 3: "Cats and dogs are great pets."	3	2
c.	Define Information Retrieval (IR) and how is it used in NLP. Describe the evolution and development of IR systems. Explain the different models used in IR. Explain the design features of a modern IR system. Also explain the QA system.	2	1

END SEMESTER EXAMINATION, JUNE- 2025
B. Tech. (CSE) / B. Tech. (Hons.) CSE in AI Semester - IV

07/06/25

Course Name: Database Management Systems**Course Code: CST241**

Time allotted: 03 Hours

Max. Marks: 100

Note: Read all the instructions carefully.

Q.1. Objectives Type (Very short/ MCQ, One-liners, Fill in the Blank, True/ False) Attempt all. (10×2=20)

QN	Questions	CO	PO
a.	Write the full form of PJNF & BCNF	4	1
b.	Define data model.	1	1
c.	What is Transaction?	5	1
d.	What is the difference between DELETE, DROP and TRUNCATE in SQL?	3	2
e.	Write syntax for CREATE TABLE.	3	3
f.	Define aggregation in ER modeling.	2	2
g.	State true or false With reason: "A foreign key can be null."	3	1
h.	Explain Data Dictionary	3	1
i.	Describe serializability	5	1,2
j.	What is a timestamp in the context of database management systems (DBMS)?	5	2

Q.2. Short notes / Short Answer Type (Attempt any five out of Seven)**(5×4=20)**

a.	What are Armstrong's Axioms? List and explain each of them with examples.	4	1,2
b.	Define Dense and Sparse index with examples.	3	2,3
c.	List various SQL operators with an example.	3	1,2
d.	Explain the concept of keys with an example.	2	1
e.	Differentiate between logical and physical data independence.	1	1,2
f.	Define canonical cover and its role in normalization.	4	2,3
g.	Present an overview of the query processing.	1	1

Q.3. Structured Question (Attempt any three out of four)**(3×10=30)**

a.	With a neat diagram, explain the structure of a DBMS & also explain DBMS advantages.	1	1,2
b.	Describe ER Notations & Construct ER Diagram for Hospital Management System.	2	1,2
c.	Explain the join dependencies based normal form with an example & Also describe the Lossy Decomposition.	3	2,3
d.	Explain functions and procedures in PL/SQL with an example.	3	2

Q.4. Long Answer / Essay type (Attempt any two out of three)**(2×15=30)**

a.	(i) What is a View in DBMS? Explain its types and use cases. (ii) EMP (empno, deptno, ename, salary, Designation, joining date, DOB, city) Write SQL Query- 1. Display names of employees whose experience is more than 10 years 2. Display age of employees 3. Display average salary of all employee 4. Display name of employee who earned highest salary 5. Display employee name starting with "S" and working in deptno 1002	3	2,3
b.	i) Describe concurrency control Techniques with illustration. ii) Explain the various locking protocols used for concurrency with example.	5	3
c.	(i) What is normalization? Explain the different normal forms with examples. (ii) Consider the universal relation R(A, B, C, D, E, F, G, H, I, J) and the set of FD's. FDs: ({A, B} → {C}, {C} → {B, D}, {B, D} → {E, F}, {A, D} → {G, H}, {A} → {I}, {H} → {J}). 1. What is the candidate key of R? 2. Decompose R into 2NF, then 3NF relations.	4	2,3

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END SEMESTER EXAMINATION, JUNE- 2025
B. Tech. (CSE)/ B. Tech. (Hons.) CSE in AI & ML Semester - IV

Course Name: Probability and Statistics**Course Code: BST241****Time allotted: 03 Hours****Max. Marks: 100****Note: Read all the instructions carefully.****Q.1. Objectives Type****(Very short/ Short Answer, MCQ, One-liners, Fill in the Blank, True/ False) Attempt all. (10×2=20)**

QN	Questions	CO	PO
a.	In case of joint probability distribution function of two dimensional random variables, say $f(x,y)$, define the marginal distribution functions of X and Y separately.	2	1
b.	Describe the procedure of hypothesis testing for single variance.	3	2
c.	Find the probability of drawing any one spade card from a pack of cards.	1	1
d.	From a pack of playing cards, two cards are drawn at random. Find the probability that one is king and the other is queen.	1	1
e.	Discuss the application of Statistics in data analysis.	3	2
f.	Give three examples of regression analysis in the real world.	5	2
g.	If X and Y are two random independent variables. The $V(6X-7Y)=$ _____.	1	1
h.	Two tailed alternative hypothesis.	4	2
i.	Poisson distribution.	2	1
j.	Distribution function of a single random variable X.	2	1

Q.2. Short notes / Short Answer Type (Attempt any five out of Seven)**(5×4=20)**

QN	Questions	CO	PO																		
a.	Describe the hypothesis testing procedure of F test for testing equality of two population variances.	2	2																		
b.	A letter is known to have come either from TATANAGAR or from CALCUTTA . On the envelope just two consecutive letters TA are visible. Using Baye's theorem, find the probability that the letter came from CALCUTTA .	1	1																		
c.	Write down the procedure of interval estimation for the sample mean. A sample of 100 students is selected from a larger university to estimate the mean GPA of all students of the university. The sample mean of GPA is 22.5, and the sample standard deviation is 2.1. Construct the 95% confidence interval for the population mean.	3	1																		
d.	Calculate the Spearman's rank correlation coefficients between X and Y. <table border="1"><tr><td>X</td><td>25</td><td>24</td><td>34</td><td>38</td><td>25</td><td>40</td><td>26</td><td>18</td></tr><tr><td>Y</td><td>13</td><td>10</td><td>18</td><td>13</td><td>15</td><td>20</td><td>18</td><td>13</td></tr></table>	X	25	24	34	38	25	40	26	18	Y	13	10	18	13	15	20	18	13	1	2
X	25	24	34	38	25	40	26	18													
Y	13	10	18	13	15	20	18	13													
e.	Explain the hypothesis testing procedure for a single mean. A random sample of 10 boys had the following scores: 7, 5, 4, 5, 3, 3, 3, 4, 2, 1. Do these data support the assumption of a population mean (score) to be 5? Given that critical value of t statistic at 0.01 level of significance with 9 df is 2.262.	2	1																		
f.	Define Binomial distribution. Ten coins are thrown simultaneously. Find the probability of getting at least six heads.	1	1																		
g.	Show that $\frac{\sum x_i(\sum x_i - 1)}{n(n-1)}$ is an unbiased estimator of θ^2 , for the sample $x_1, x_2, \dots, x_n$ drawn on X which takes the values 1 or 0 with respective probabilities θ and $(1 - \theta)$.	2	1																		

P.T.O/-

(3×10=30)

Q.3. Structured Question (Attempt any three out of four)

Q.3. Structured Question (Attempt any three out of four)				CO	PO																					
QN	Questions																									
a.	Describe the procedure of hypothesis testing, and hence write down the procedure to calculate paired t statistic.			2	2																					
b.	Write down the formula for marginal and conditional distribution of a random variable X. The following table represents the joint probability distribution of discrete random variable (X,Y).			2	1																					
<table><tr><th colspan="2" rowspan="2">X \ Y</th><th colspan="3">X</th></tr><tr><th>1</th><th>2</th><th>3</th></tr><tr><th rowspan="3">Y</th><th>1</th><td>1/12</td><td>1/6</td><td>0</td></tr><tr><th>2</th><td>0</td><td>1/9</td><td>1/5</td></tr><tr><th>3</th><td>1/18</td><td>1/4</td><td>2/15</td></tr></table> (i) Evaluate marginal distribution of X. (ii) Evaluate conditional distribution of Y given X=2.						X \ Y		X			1	2	3	Y	1	1/12	1/6	0	2	0	1/9	1/5	3	1/18	1/4	2/15
X \ Y		X																								
		1	2	3																						
Y	1	1/12	1/6	0																						
	2	0	1/9	1/5																						
	3	1/18	1/4	2/15																						
c.	Define maximum likelihood estimator, and the procedure. Further, find the maximum likelihood estimator for the parameter of Poisson distribution,			3	1																					
d.	Explain principle of least square for line of regression of Y on X.			1	2																					

Q.4. Long Answer / Essay type (Attempt any two out of three)

(2×15=30)

Q.4. Long Answer / Essay type (Attempt any two out of three)		CO	PO																				
QN	Questions																						
a.	For the given dataset, calculate Karl Pearson's correlation coefficient between X and Y. Further, find the line of regression of Y on X, where Y is dependent, and X is independent variable. <table><tr><td>X</td><td>8</td><td>10</td><td>12</td><td>20</td><td>22</td><td>14</td><td>12</td></tr><tr><td>Y</td><td>22</td><td>18</td><td>10</td><td>12</td><td>11</td><td>15</td><td>16</td></tr></table>	X	8	10	12	20	22	14	12	Y	22	18	10	12	11	15	16	4	2				
X	8	10	12	20	22	14	12																
Y	22	18	10	12	11	15	16																
b.	A study was conducted to determine whether there is an association between a person's occupation and their preferred source of news. A random sample of 120 individuals was surveyed, and the results are shown in the contingency table below: <table><tr><th>Occupation / News Source</th><th>TV</th><th>Online</th><th>Newspaper</th></tr><tr><td>Student</td><td>10</td><td>20</td><td>5</td></tr><tr><td>Professional</td><td>5</td><td>15</td><td>10</td></tr><tr><td>Retired</td><td>10</td><td>5</td><td>10</td></tr><tr><td>Homemaker</td><td>15</td><td>5</td><td>10</td></tr></table> At 0.05 level of significance, test whether the person's occupation is associated with preferred source of news. Given that critical value of Chi square statistic is 12.59 with 6 degrees of freedom.	Occupation / News Source	TV	Online	Newspaper	Student	10	20	5	Professional	5	15	10	Retired	10	5	10	Homemaker	15	5	10	5	2
Occupation / News Source	TV	Online	Newspaper																				
Student	10	20	5																				
Professional	5	15	10																				
Retired	10	5	10																				
Homemaker	15	5	10																				
c.	Two groups of students were given two different methods of studying for an exam. Group 1 used method A, and Group 2 used method B. The exam scores (out of 10) for each group are as follows: Group 1 (Method A): 4, 7, 5, 7, 8, 6, 4, 7, 3, 9, 2, 2 Group 2 (Method B): 2, 8, 3, 4, 6, 7, 2, 5, 5, 4, 3, 2, 3, 7, 1 Perform an independent t-test at the 0.05 significance level to determine if average scores by method A is greater than average scores by method B. Given that critical value of t statistic is 1.76 with 25 df.	5	2																				

END SEMESTER EXAMINATION, JUNE- 2025
B. Tech. (CSE)/ B. Tech. (Hons.) CSE in AI Semester - IV

Course Name: Theory of Computation

Course Code: CST243/CST242

Time allotted: 03 Hours

Max. Marks: 100

Note: Read all the instructions carefully.

Q.1. Objectives Type (Very short/ Short Answer, MCQ, One-liners, Fill in the Blank, True/ False)
Attempt all. (10×2=20)

	CO	PO
a. Define an ambiguous CFG.	1	1,2
b. Distinguish between DPDA and NPDA	1	1,2
c. Define unrestricted grammar	1	2
d. Define regular expression	1	1
e. Give a description about FA with empty moves.	1	1
f. Write about relations on sets.	1	1,2
g. Define unit production	1	1,2
h. List any 5 identity rules for regular sets.	1	1,2
i. List any 2 techniques for Turing Machine Construction	1	2
j. Define Grammar? What are the tuples?	1	2

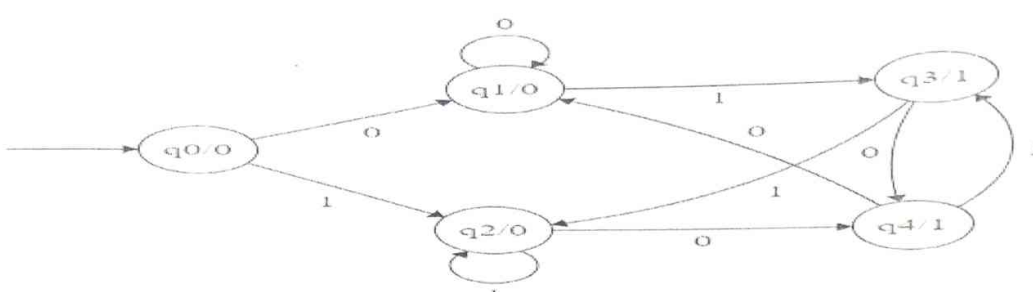
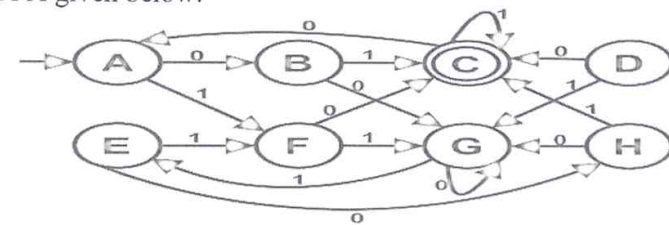
Q.2. Short notes / Short Answer Type (Attempt any five out of Seven) (5×4=20)

	CO	PO
a. Design a NFA in which all the string contain substring 1110.	2	2,3
b. Design a DFA that recognizes the set of strings such that every block of it's Consecutive symbols contain at least two 0's on $\Sigma = \{0, 1\}$	2	2
c. What are state diagram and state transition table?	2	1,2
d. Construct an NFA accepting the set of all strings over $\{0,1\}$ whose second symbol from last is 1.	2	2,3
e. Give the formal definition of Moore machine.	2	1,2
f. Write about the model of Push Down Automata and context free grammar.	2	2
g. Construct Turing Machine for multiplication of two unary numbers.	2	1

P.T.O./-

(3×10=30)

Q.3. Structured Question (Attempt any three out of four)

	CO	PO
a. Convert Moore to Mealy Machine 	3	2
b. Minimize the DFA given below: 	3	2
c. Convert the following grammar into Greibach normal form. $S \rightarrow AA/a$ $A \rightarrow SS/b$	3	1,2
d. Briefly explain about various operations on Strings with suitable examples.	3	1,2

Q.4. Long Answer / Essay type (Attempt any two out of three)

(2×15=30)

	CO	PO
a. i. State and explain Arden's Theorem. ii. From the identities of Regular Expression prove that: $(1+100^*) + (1+100^*) (0+10^*) (0+10^*) = 10^* (0+10^*)$	4	1,2
b. iii. Draw a transition diagram for Turing machine and explain it in detail? iv. Design a Turing Machine to accept the set of all palindrome over $\{0,1\}^*$. Draw the Transition diagram for the same.	4	1,2
c. i. How to eliminate unit productions? Discuss with example. ii. Explain about different normal forms with example.	4	2,5

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END SEMESTER EXAMINATION, JUNE- 2025

B. Tech. (CSE)/ B. Tech. (Hons.) CSE in AI Semester - IV

Course Name: Java Programming

Course Code: CST244/CST243

Time allotted: 03 Hours

Note: Read all the instructions carefully.

Max. Marks: 100

Q.1. Attempt all.

QN	Questions	(10×2=20)	
	CO	PO	
a.	Write the output for the following code: <pre>public class Test { public static void main(String[] args) { int a = 10, b = 0; try { int result = a / b; System.out.println("Result: " + result); } catch (ArithmeticException e) { System.out.println("Error: " + e.getMessage()); } System.out.println("Program continues..."); } }</pre>		1,2
b.	Is multiple inheritance supported by Java? If no, then how it can be achieved		1,2
c.	Overloading and overriding achieve which property of object-oriented concepts. Discuss that property.		1,2
d.	What is an abstract class and what is its purpose?		1,2
e.	Write the output for the following code: <pre>public class Test { public static void main(String[] args) { int a = 10, b = 0; try { int result = a / b; System.out.println("Result: " + result); } catch (ArithmeticException e) { System.out.println("Error: " + e.getMessage()); } System.out.println("Program continues..."); } }</pre>		1,2
f.	Is multiple inheritance supported by Java? If no, then how it can be achieved?		1,2
g.	Show the use of static keyword in java with an example code.		1,2
h.	Explain parameterized constructor		1,2
i.	Explain Prepared Statement in JDBC		5
j.	Explain AWT		5

P.T.O./-

(5×4=20)

Q.2. Attempt any five out of Seven.

QN	Questions	CO	PO
a.	Define thread. Differentiate between multithreading and multiprocessing	3	1,2,3
b.	Write a java program to implement following functions of string: a. Calculate length of string b. Compare between strings c. Concatenating strings	2	1,2,3
c.	Explain the following keywords used in exception handling: (i) try (ii) catch (iii) throw (iv) finally	2	1,2,3
d.	Define applet. Write a program to create an applet to display message "Welcome to java Applet"	4	1,2,3
e.	Explain the concept of garbage collection in Java	3	1,2,3
f.	Write a program of creating a thread by implementing runnable class	3	1,2,3
g.	Explain interface in Java, and why do we use it? What is the default access modifier for methods and fields in an interface?	1	1,2

Q.3. Attempt any three out of four.

(3×10=30)

QN	Questions	CO	PO
a.	Explain package. Write a java program to find the factorial value of the given number using user defined package concept	2	1,2,3
b.	Illustrate all the methods used in multithreading?	3	1,2,3
c.	Explain the syntax of following terms to create them: (ii) GridLayout (iii) BorderLayout	4	1,2,3
d.	Illustrate JVM, JDK and JRE in Java. Interpret the different states of Java Program execution	1	1,2

Q.4. Attempt any two out of three.

(2×15=30)

QN	Questions	CO	PO
a.	i) Illustrate all the steps in database connectivity? ii) Write a program to demonstrate database connectivity using JDBC	5	1
b.	i) Explain Event Delegation Model? ii) Write a program to demonstrate event handling in Swing components	4	1,2,3
c.	i) Differentiate between multithreading and multiprocessing ii) Explain the thread life cycle with neat and clean diagram	3	1,2,3

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END SEMESTER EXAMINATION, JUNE- 2025**B. Tech. (CSE)/B. Tech. (Hons.) CSE in AI & ML Semester - IV****Course Name: Introduction to Machine Learning****Course Code: CST242/PCT412**

Time allotted: 03 Hours

Max. Marks: 100

Note: Read all the instructions carefully.

Q.1. Objectives Type (Very short) Attempt all.**(10×2=20)**

a.	What is Machine Learning	CO1	PO1
b.	Explain a Well posted learning problem	CO1	PO1
c.	Explain Confusion Matrix	CO2	PO1
d.	What is Cross Validation?	CO2	PO1
e.	What is Bayes Theory	CO4	PO1
f.	What is the primary goal of reinforcement learning?	CO3	PO1
g.	What is Image Segmentation	CO4	PO1
h.	What is overfitting problem	CO3	PO1
i.	What is K in KMean	CO3	PO1
j.	Write about Bagging and Boosting process	CO5	PO1

Q.2. Short notes Type (Attempt any five out of Seven)**(5×4=20)**

a.	Discuss two applications of machine learning with examples.	CO1	PO1
b.	Describe the K-Means clustering algorithm. Discuss its basic steps and how it assigns data points to clusters.	CO3	PO1
c.	What is multiclass classification, and how does it differ from binary classification? Provide examples of real-world applications where multiclass classification is used.	CO2	PO1,2
d.	Explain Naïve Bayes Classifier with an Example	CO5	PO1
e.	Write Reinforcement learning problem characteristics.	CO4	PO1
f.	Explain PCA	CO5	PO1
g.	Discuss the types of data in ML	CO4	PO1,2

Q.3. Structured Question (Attempt any three out of four)**(3×10=30)**

a.	(i) Write the perspective and issues in Machine Learning (ii) Explain Types of machine learning	CO1	PO1
b.	(i) Describe Gradient Descent as an optimization algorithm. Discuss its advantages and limitations.	CO4,2	PO1,2
c.	(i) Explain DBSCAN algorithm (ii) Explain Types & Source of the data	CO4,5	PO1
d.	(i) Explain decision tree algorithm in ML (ii) Explain the performance metrics of machine learning	CO3	PO1

Q.4. Long Answer type (Attempt any two out of three)**(2×15=30)**

a.	(i) Discuss the concept of anomaly and novelty detection in the context of clustering. (ii) Compare and contrast Bayesian Gaussian Mixture Models with traditional clustering algorithms for anomaly and novelty detection. (iii) How do you design a checkers learning problem	CO1,4,5	PO1
b.	(i) What is Regression, also discuss linear regression. (ii) Discuss Hyper parameter Tuning	CO2	PO1
c.	(i) Discuss the role of data visualization in exploratory data analysis for Machine Learning. (ii) Discuss visualization techniques	CO1,2	PO1,2,4
