

END SEMESTER EXAMINATION, JANUARY -2026

B. Tech. (CSE)/B. Tech. (Hons.) (CSE) in AI, DS & Cyber Security Semester – III

Course Name: Discrete Mathematics

Course code: BST231

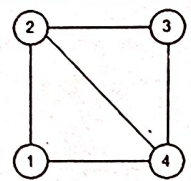
Time allotted: 03 Hours

Max. Marks: 100

Note: Read all the instructions carefully.

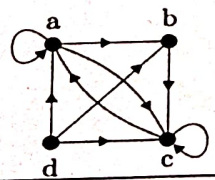
Q.1. Attempt all.

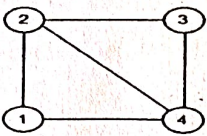
(10×2=20)

QN	Questions	CO	PO
a.	Determine the relation R represented by the Hasse diagram. 	5	1
b.	Differentiate between equivalence relation and partial order relation.	2	1
c.	If $R = \{(1,2), (4,3), (2,2), (2,1), (3,1)\}$ be a relation on $S = \{1,2,3,4\}$, find the reflexive closure.	2	2
d.	Is the given graph form a Euler circuit or path? Give reason to support your answer. 	3	2
e.	Draw the directed graph that represent the relation $R = \{(1,1), (2,2), (1,2), (2,3), (3,2), (3,1), (3,3)\}$ on $X = \{1,2,3\}$.	2	1
f.	Consider the following relation $R = \{(1,1), (2,2), (2,3), (3,2), (4,2), (4,4)\}$ on $A = \{1,2,3,4\}$. Is R i) Antisymmetric ii) Symmetric	2	1
g.	What do you understand by chromatic number? Draw the graph having chromatic no 2 and three.	3	1
h.	Distinguish between $\emptyset$, $\{0\}$, $\{\emptyset\}$, 0 .	1	1
i.	If $A = \{1,2,3,4,5,6\}$, $B = \{3,6,8,12,17,18\}$, then find $A \cup B$, $A \cap B$, $A - B$	1	2
j.	What do you understand by semi group?	5	1

Q.2. Attempt any five out of Seven.

(5×4=20)

QN	Questions	CO	PO
a.	Find the first five terms of the given recurrence relation $a_k = a^2_{k-1}$, for all integers $k \geq 2$, $a_1 = 12$.	1	1
b.	Find whether the function is onto or not. $f: \mathbb{Z} \rightarrow \mathbb{Z}$ defined by $f(x) = 5x - 9$ for all $x \in \mathbb{Z}$.	2	2
c.	Find the in-degree and out-degree of each vertex of the graph given below. 	3	2
d.	What is Abelian group?	5	1
e.	If $f: \mathbb{R} \rightarrow \mathbb{R}$ and $g: \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(n) = n^2$, $g(n) = n + 1$, $h(n) = n - 1$. Find the following composition functions: i) $g \circ f \circ h(n)$ ii) $f \circ g \circ h(n)$	2	2

f.	Find all the spanning trees of the graph.		
			
g.	Draw the Hasse diagram for the divisibility relation on the set $A = \{3, 6, 12, 24, 48\}$	2	2

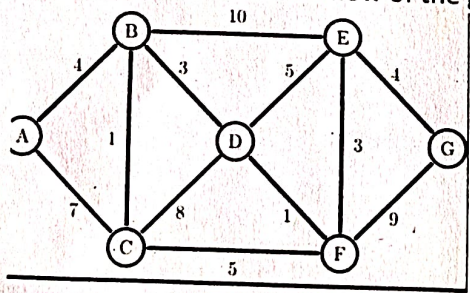
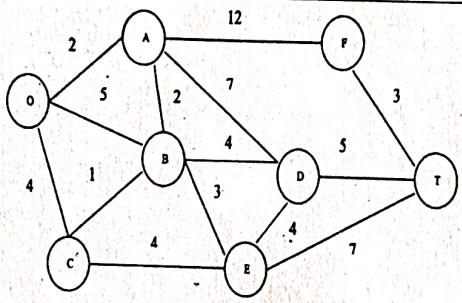
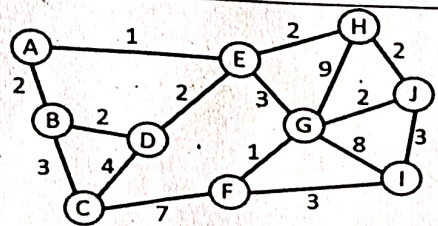
Q.3. Attempt any three out of four.

(3×10=30)

QN	Questions	CO	PO
a.	Let $A = \{1, 2, 3, 4\}$, for the relation R whose matrix is given. Find the matrix of transitive closure by using Warshall's algorithm.	2	2
	$M_R = \begin{bmatrix} 1 & 0 & 0 & 1 \\ 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 \end{bmatrix}$		
b.	Prove by the method of induction ($n \in \mathbb{N}$). $\frac{1}{3.5} + \frac{1}{5.7} + \frac{1}{7.9} + \dots + \frac{1}{(2n+1)(2n+3)} = \frac{n}{3(2n+3)}$	1	2
c.	Solve $a_n = a_{n-1} + 6a_{n-2}, n \geq 2$ with initial conditions $a_0 = 1, a_1 = 1$.	1	3
d.	The relation R on a set $A = \{1, 2, 3, 4\}$ is defined by $R = \{(1,1), (1,2), (1,4), (2,2), (2,1), (2,4), (3,3), (3,4), (3,2), (4,2), (4,1)\}$. Find the diagram for R and the matrix M_R .	2	2

Q.4. Attempt any two out of three.

(2×15=30)

QN	Questions	CO	PO
a.	a.1. Apply Dijkstra's algorithm to the graph and find the shortest path from O to T. a.2. Find out the maximal flow of the given network.  	3	3
b.	Find the minimal spanning tree of the weighted graph using Prim's algorithm.	4	3
			
c.	* is a binary operation defined on Q. Find which binary operations are commutative and which of them are associative? Also find the identity element, (if it exists) i) $a * b = a + b + ab, a, b \in \mathbb{Z}$ ii) $a * b = a + ab, a, b \in \mathbb{Z}$.	5	2

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END SEMESTER EXAMINATION, JANUARY - 2026
B. Tech./B. Tech. (Hons.) in AI/DS & Cyber Security – Semester – III

Course Name: Computer System Architecture**Course code: CST231****Time allotted: 03 Hours****Max. Marks: 100****Q.1. Attempt all.****(10×2=20)**

QN	Questions	CO	PO
a.	Define Interrupt.	CO3	PO3
b.	What is Role of the Von-Neumann Architecture?	CO1	PO1
c.	Define page fault.	CO4	PO1
d.	What is hazard pipeline?	CO5	PO3
e.	What is cache memory?	CO4	PO2
f.	What is register?	CO1	PO1
g.	Explain any two Peripheral device.	CO3	PO1
h.	What is bus grant and bus request.	CO3	PO2
i.	What is primary operation in stack?	CO3	PO1
j.	MBR and AC stands for.....	CO1	PO2

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

QN	Questions	CO	PO
a.	Explain virtual memory and page fault.	CO4	PO2
b.	Explain arithmetic and logic operations with examples.	CO2	PO2
c.	Explain the system bus and its types.	CO1	PO1
d.	Differentiate SRAM and DRAM.	CO4	PO2
e.	Explain Simplex, Half duplex and full duplex.	CO3	PO1
f.	Explain pipeline and its types.	CO5	PO2
g.	What is Von-Neumann Architecture? Explain with diagram.	CO1	PO1

Q.3. Attempt any three out of four.

QN	Questions	CO	PO
a.	Explain the instruction cycle with the help of a neat diagram. Discuss the various phases of the instruction cycle. Also, elaborate on the sequence of micro operations used in the Fetch cycle.	CO1	PO1
b.	What is the role of Asynchronous Data Transfer? Explain in detail with its types and what is difference between Asynchronous and synchronous.	CO3	PO2
c.	What is Assembler? Explain the first pass with diagram. What is the difference between machine language and assembly language	CO1	PO2
d.	Explain the various addressing mode. (i) Immediate mode (ii) register mode (iii) direct address mode.	CO1	PO1

Q.4. Attempt any two out of three.

(2×15=30)

QN	Questions	CO	PO
a.	Define the control unit. Explain the micro programmed control unit with the help of a neat diagram. Differentiate between the hardwired and the micro programmed control unit.	CO2	PO2
b.	(i) What is DMA? Explain the DMA transfer with neat diagram. (ii) Explain mode of transfer.	CO3	PO2
c.	Define page fault. Explain the page replacement algorithms. Consider the following page reference string: 1,2,3,4,2,1,5,6,2,1,3,7,6,3,2,1,2,3,6. How many page faults would occur for the algorithm LRU, MRU And OPR using three frames?	CO4	PO5

Course code: CST232

Max. Marks: 100

Q.1. Attempt all questions. All carry equal marks

(2 x 10 = 20)

Q.2. Short notes / Short Answer Type (Attempt any five out of Seven)

(5×4=20)

Page 1 of 2

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

(3×10=30)

Q.3. Structured Question (Attempt any three out of four)																		
S. No	Questions																	
a.	(i) Explain the following i) file types ii) file operation iii) file attributes (ii) What is CIA? (iii) Define swapping.	1																
b.	a. What do you mean by cooperating process? b. Explain the concept of virtual memory. c. What is multiprocessor system? Give some advantages.	2	2															
c.	a. Explain solution to producer-consumer problem using semaphores. b. Explain the difference between long term and short term and medium-term schedulers c. Explain three main functions of operating system	3	2															
d.	Consider the following process: <table border="1"><thead><tr><th>Proces s</th><th>Arriva l 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>9</td></tr><tr><td>P4</td><td>3</td><td>5</td></tr></tbody></table> (i) What is the average waiting and turnaround time for these process with? o FCFS Scheduling o Preemptive SJF Scheduling (ii) List the major difference between thread and process. (iii) What do ypu mean by multiprogramming?	Proces s	Arriva l Time	Burst Time	P1	0	8	P2	1	4	P3	2	9	P4	3	5	3	3
Proces s	Arriva l Time	Burst Time																
P1	0	8																
P2	1	4																
P3	2	9																
P4	3	5																

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

(2×15=30)

S. No	Questions	CO	PO
a.	(i) Write short note on: • Critical section • Semaphore • Demand segmentation (ii) What is system call? Explain in detail the system call sequence to copy the contents of one file to another	1	1
b.	(i) Memory partitions of 100kb,500 kb,200 kb,300kb,600 kb is available how would best, worst, first fit algorithm to place processes 212,417,112,426 in order. Which is the best algorithm (ii) Briefly explain the various kinds of program threats and system threats.	5	3
c.	(i) A hard disk having 2000 cylinders, numbered from 0 to 1999, the drive is currently serving the request at cylinder 143 and the previous request was at 125. The status of queue is as follows: 86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130. What is the total distance (in cylinders) that the disk arm moves to satisfy the entire pending request for each of the following disk scheduling algorithms- C-LOOK, SCAN? (ii) A process references 5 pages A, B, C, D, E in the following order A, B, C, D, A, E, B, C, E, D Assuming that the replacement algorithm is LRU and FIFO, find out the number of page faults during the sequence of references, starting with an empty main memory with 3 frames.	4	3

END SEMESTER EXAMINATION, JANUARY - 2026**B. Tech. (CSE)/B. Tech. (CSE) in AI, DS & Cyber Security – Semester – III****Course Name: Data Structures****Course code: CST233****Time allotted: 03 Hours****Max. Marks: 100****Note: Read all the instructions carefully.****Q. 1. Attempt all.****(2 x 10 = 20)**

S.No	Questions	CO	PO
a.	Differentiate singly linked list and doubly linked list.	3	1
b.	Explain the advantages and disadvantages of an array.	2	1
c.	Mention different ways of graph traversal.	5	1
d.	Explain the necessary condition for constructing a binary search tree?	4	1
e.	List the advantages and disadvantages of linked list.	3	1
f.	Define the term Data structure. Differentiate linear and non-linear data structure.	1	1
g.	Mention the graph traversal methods.	4	1
h.	Define time-space trade off.	2	1
i.	What are the limitations of recursion?	3	1
j.	Differentiate static memory allocation and dynamic memory allocation?	1,2	1

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

S.No	Questions	CO	PO
a.	What do you mean by the term LIFO and FIFO means? Where we have to implement these terms in data structure? Explain with an example.	3	1,2
b.	Define the term stack in data structure? Write an algorithm to POP and PUSH an element into the stack using linked list.	3	1,2,3
c.	Evaluate the following postfix expression: $65 * 78 + * 87 - 45 * ++$	3	3
d.	Define properties of Binary search tree. How to create a BST? Explain with example.	4	1,2
e.	What are the different types of data structure? Describe the need of complexity of analysis of algorithm.	1,2	1,2
f.	Convert the following infix expression in to postfix expression: $K+L-M*N+(O^P)*W/U/V*T+Q$	3	3
g.	Describe time and space complexity. Discuss best, average and worst case for finding a given number from an array of integers.	1,2	1,2

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

S.No	Questions	CO	PO
a.	Construct a B-tree of order 3 by inserting numbers from 1 to 10.	4	2,3
b.	Compare and contrast BFS and DFS traversal methods for graph with suitable example.	4	2,3
c.	Write a C program of selection sort. Also analyze the running time of your program.	5	1,2
d.	Name the various tree traversal algorithms. Create the binary expression tree from the following expression and traverse it using all possible tree traversal $[a+(b-c)]*[(d-e)/(f+g-h)]$.	4	2,3,4

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

S.No	Questions	CO	PO
a.	i) Define complete binary tree. Find the height of the binary tree. Explain the different ways of traversing a binary tree. ii) Define two-way list. What are the advantages of two way list over one way list?	3,4	2,3
b.	i) Write an algorithm of quick sort. ii) Apply insertion sort on the following elements: $\{21, 11, 5, 78, 49, 54, 72, 88\}$	5	2,3
c.	i) Write a Pseudo code for insertion and deletion in binary search tree. Also give an explain to show the working of both the operations. ii) Postorder traversal of a given binary search tree T produces the following sequence of keys $10, 9, 23, 22, 27, 25, 15, 50, 95, 60, 40, 29$ what are result of an in-order traversal of the tree T? Also construct the binary search tree.	4	1,2,3,4

END SEMESTER EXAMINATION, JANUARY - 2026**B. Tech. (CSE)/B. Tech. (CSE) in AI/DS & Cyber Security– Semester - III****Course Name: Python Programming****Course code: CST234****Time allotted: 03 Hours****Max. Marks: 100****Q.1. Attempt all.****(10×2=20)**

QN	Questions	CO	PO
a.	Why is indentation important in Python?	1	1
b.	Give an example of a Python comment.	1	1
c.	Name any two Python built-in data types.	1	1
d.	What is the method to find the length of a string in Python?	1	2
e.	Define a tuple in Python.	1	2
f.	<pre>x = True y = False z = x or y and not x print(z)</pre>	1	2
g.	Write the syntax for an if-else statement.	1	2
h.	List any two features of Python.	1	1
i.	What symbol is used for comments in Python?	1	1
j.	<pre>s = "Python" print('P' in s) print('py' not in s)</pre>	1	1

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

QN	Questions	CO	PO
a.	What is the role of sep and end in the print statement? What is the output of the following program: i. <pre>print("My\name\nis\nBond.", end= " ") print("James Bond.")</pre> ii. <pre>print(sep= "&", "Fish", "Chips")</pre>	2	3
b.	Write a python program to find the given number is odd or even.	2	3
c.	Explain in detail the various types of operators in Python, with examples.	2	3
d.	What is the output of the following snippet? <pre>lst = [1, 2, 3, 4, 5] lst.insert(1, 6) del lst[0] lst.append(1) print(lst)</pre>	2	3
e.	Discuss the rules and conventions for naming identifiers in Python.	2	2
f.	What will be the output of following programs? <pre>greek_alphabets=['Mu', 'Nu', 'Xi', 'Omicron', 'Pi', 'RhoTau', 'Upsilon', 'Phi','Chi']</pre> i. <pre>greek_alphabets[:6]</pre> ii. <pre>greek_alphabets[6:]</pre> iii. <pre>greek_alphabets[:2]</pre> iv. <pre>greek_alphabets[:-1]</pre> v. <pre>greek_alphabets[0:6:2]</pre>	2	2
g.	What are the benefits of using OOP in programming?	2	2

Q.3. Attempt any three out of four.

(30)

QN	Questions		
a.	Write a Python program to create a student record system using dictionaries. Include operations like adding, updating, and deleting records.	3	
b.	Explain the difference between break, continue, and pass with examples.	3	2
c.	Discuss in detail the decision-making process in Python, supported by examples.	4	3
d.	Explain the role of the self keyword in Python classes. Write a comprehensive program to demonstrate its use.	4	2

Q.4. Attempt any two out of three.

(2×15=30)

QN	Questions	CO	PO
a.	Write a Python program to demonstrate file handling by creating a file, writing data, and then reading the data back.	5	1
b.	Implement Python program to find sum of natural numbers.	4	
c.	Write a Python program to create a word count application using file handling.	4	2

END SEMESTER EXAMINATION, JANUARY – 2026**B. Tech./B. Tech. (CSE) in DS & ML – Semester – III****Course Name: Introduction to Data Science****Course code: PCT321****Time allotted: 03 Hours****Max. Marks: 100****Q.1. Attempt all.****(10×2=20)**

QN	Questions	CO	PO
a.	Define DBSCAN.	4	1
b.	Explain PCA.	3	2
c.	What is hyperplane?	3	2
d.	What is correlation?	2	1
e.	What is the difference between hierarchical and partitional clustering?	3	2
f.	What is data pre- processing?	2	1
g.	What are interactive dashboards?	5	2
h.	Define EDA.	2	1
i.	Explain distributed computing.	1	2
j.	Define Data Mining.	1	2

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

a.	Write a short note on Principal Component Analysis (PCA).	3	2
b.	Differentiate between supervised learning and unsupervised learning.	4	2
c.	Differentiate between box plots, histograms, and scatter plots with examples.	2	1
d.	Explain the difference between linear SVM and non-linear SVM.	3	2
e.	Explain the concept of the KNN classification technique. Outline the major steps in how it makes predictions.	4	1
f.	Write a brief note on tools used for building dashboards. Mention at least two tools and their functionalities	5	2
g.	Compare classification and regression, highlighting their key differences.	4	2

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

a.	Describe various forms of data preprocessing. Why is preprocessing essential in data mining?	2	3
b.	Discuss SVM in detail, including margins, support vectors, optimization objective, kernel functions, and real-world applications.	4	2
c.	Describe the architecture and working principle of dc.js in building dynamic dashboards.	5	3
d.	Explain ensemble learning techniques (Bagging, Boosting, Random Forest) with advantages.	4	2

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

a.	Discuss in detail the working of Decision Trees. Write a Python script that builds a Decision Tree classifier using the scikit-learn library on any chosen sample dataset.	4	3
b.	Describe the significance of data visualization within the field of data analytics. Elaborate on different visualization tools and charts— including bar graphs, line charts, scatter diagrams, histograms, and heat maps—illustrating each with suitable examples.	5	2
c.	A financial institution wants to process millions of transactions per second to detect fraud in real-time. Which Big Data technologies (Hadoop, Spark, Flink, Kafka) would you recommend? Why?	1	3

END SEMESTER EXAMINATION, JANUARY – 2026**B. Tech./B. Tech. (CSE) in Cyber Security – Semester – III****Course Name: Introduction to Classical Cryptography
& Number Theory****Course code: PCT301****Time allotted: 03 Hours****Max. Marks: 100****Q.1. Attempt all.****(10×2=20)**

QN	Questions	CO	PO
a.	What device monitors and controls traffic?	2	1
b.	What is the full form of VPN?	2	1
c.	What is the secure version of HTTP?	2	1
d.	What protocol resolves domain names?	4	1
e.	What protocol protects email transmission?	2	1
f.	What is plaintext converted into during encryption?	3	1
g.	What is the process of decoding ciphertext?	5	1
h.	What is used to encrypt and decrypt in symmetric cryptography?	2	1
i.	Which cryptographic method uses a public and private key?	3	1
j.	What asymmetric algorithm uses prime factorization?	3	1

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

a.	Give the applications of the public key crypto systems	2	1,2
b.	Analyse the purpose of Diffie Hellman key exchange	1	1,2,3,5
c.	State any three requirements for authentication.	1	1
d.	State and Describe Fermat's theorem. Evaluate $3^{21} \bmod 11$ using Fermat's theorem.	5	1,2,3
e.	Discuss the following (i) Security services. (ii) Security mechanisms.	3	1
f.	Tabulate the substitution Techniques in detail.	3	1,2,3
g.	Explain the OSI security architecture in detail.	1	1,2,3

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

a.	Summarize Chinese Remainder theorem and find X for the given set of congruent equation using CRT. $X \equiv 1 \pmod{5}$ $X \equiv 2 \pmod{7}$ $X \equiv 3 \pmod{9}$ $X \equiv 4 \pmod{11}$	4	1,2,3,4
b.	User A and B use Diffie-Hellman key exchange a common prime $q=71$ and a primitive root $\alpha = 7$. Calculate the following. i. If user A has private key $X_A=5$, what is A's public key Y_A . ii. If user A has private key $X_B=12$, what is B's public key Y_B and what is shared secret key?	3,5	1,2,3,4,5
c.	What is Digital Signature? Explain how it is created at the sender end and retrieved at receiver end. differentiate digital signature from digital certificate.	2,4	1
d.	In a public-key system using RSA, you intercept the cipher text $C = 10$ sent to a user whose public key is $e = 5$, $n = 35$. What is the plaintext M?	3	1,2,5

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

a.	Explain SHA algorithm with neat diagram.	2,4	1,2,3,5
b.	Explain the different types of viruses in detail. Suggest scenarios for deploying these types in network scenario.	2	1,2,3,5
c.	Explain the DES and working of DES with diagrams.	3,4	1,2,3,4,5

END SEMESTER EXAMINATION, JANUARY – 2026**B. Tech. (CSE) in AI & ML – Semester – III****Course Name: Introduction to Artificial Intelligence****Course code: PCT311****Time allotted: 03 Hours****Max. Marks: 100**

S. No	Question Statement	CO	PO
Q.1.	Objectives Type - (Very short/ Short Answer, MCQ, One-liners, Fill in the Blank, True/ False) Attempt all. (10×2=20)	CO1, CO2	PO1-PO5, PO9, PO12
a.	Uninformed search strategy among the following is A. A* B. Greedy C. Breadth-First Search D. Hill-climbing		
b.	Transformational grammar focuses on A. Pure vocabulary B. Transformations between deep and surface structures C. Sound patterns D. Fuzzy membership		
c.	True/False (with justification): Heuristics always guarantee optimal solutions.		
d.	True/False (with justification): Transition nets are used to represent sentence structure.		
e.	Fill in the blank: In Greedy search, the evaluation function is _____.		
f.	A fuzzy controller uses _____ rules.		
g.	Semantic nets are mostly used for A. Parsing sentences B. Representing knowledge C. Computing probabilities D. Pattern clustering		
h.	Which is part of pattern recognition? A. Tokenization B. Truth maintenance C. Feature extraction D. Predicate calculus		
i.	True/False (with justification): Possibility values in fuzzy logic lie between 0 and 1.		
j.	Speech recognition converts speech into _____.		

Q.2.	Short notes / Short Answer Type (Attempt any five out of Seven) (5×4=20)	CO1, CO2, CO3	PO1-PO5, PO9, PO12
a.	PROLOG basics		
b.	Greedy search		
c.	Parsing techniques		
d.	Heuristic evaluation function		
e.	Structured descriptions in pattern recognition		
f.	Fuzzy inference		
g.	Object identification in pattern recognition		

Q.3.	Structured Question (Attempt any three out of four) (3×10=30)	CO1, CO3, CO4	PO1-PO5, PO9, PO12
a.	(i) Explain uninformed search. (ii) Describe heuristic search. (iii) Explain Breadth First Search		
b.	(i) Explain parsing. (ii) Describe transition nets. (iii) What is sentence generation?		
c.	(i) Represent "Every employee has a department." in FOPC. (ii) Explain production rules with an example. (iii) Explain the interface system.		
d.	(i) Define fuzzy arithmetic. (ii) Explain linguistic models. (iii) Describe semantic interpretation in PR.		

Q.4.	Long Answer / Essay type (Attempt any two out of three) (2×15=30)	CO4, CO5	PO1-PO5, PO9, PO12
a.	(i) Explain A* search. (ii) Compare A* and Greedy Best-First Search.		
b.	(i) Describe context-free grammars. (ii) Explain sentence generation and translation.		
c.	(i) Explain object identification. (ii) Discuss machine perception.		
