Paper / Subject Code: 70651 / Mathematical Foundation for Computer science II

MCA / Sem-II / 2Yrs Course / Jan-2024 (CSH-2023)

Time: 3 Hours

Max. Marks: 80

Instructions:

i. Question 1 is compulsory.

ii. Solve any three from remaining.

Q1.

A Solve the following problem using Graphical Method **(10)**

Maximize $Z = 3x1 + 2x2$

Subject to

$2x1 + x2 \leq 40$

$x1 + x2 \leq 24$

$2x1 + 3x2 \leq 60$

And $x1, x2 \geq 0$

B Find an IBFS to the following transportation problem by **(10)**

i) VAM Method

ii) North-West Corner Rule

Plant	Distribution Centre				Supply
	A	B	C	D	
I	2	3	11	7	6
II	1	0	6	1	1
III	5	8	15	9	10
Requirement	7	5	3	2	

Q2.

A Use Big M to solve the following LPP

Maximize $Z = 2x_1 + 3x_2$

subject to $x_1 + x_2 \geq 1$

$x_1 + 2x_2 \geq 6$

and $x_1, x_2 \geq 0$

B Solve the following assignment problem and find the optimal assignment that will result in minimum man hours needed **(10)**

	Jobs				
Workers		A	B	C	D
	I	5	3	2	8
	II	7	9	2	6
	III	6	4	5	7
	IV	5	7	7	8

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Q3.

A A doctor has been thinking about starting his own nursing home. The problem is to decide how large the nursing home must be. The annual returns will depend on both the size of the nursing home and a number of marketing factors. Identify the following **(10)**

(a) Maximax decision (b) Maximin decision
(c) Develop an opportunity loss table and determine the minimax decision
(d) What is the criterion of realism decision? (Use $\alpha = 0.8$)
(e) What is the equally likely decision?

Size of nursing home	States of Nature		
	Good market	Fair market	Poor market
Small (S)	50000	20000	-10000
Medium (M)	70000	35000	-25000
Large (L)	90000	35000	-45000
Very Large (VL)	200000	25000	-120000

B Solve the following LPP using Simplex Method **(10)**

Maximize $Z = 80x1 + 55x2$
subject to $4x1 + 2x2 \leq 40$
$2x1 + 4x2 \leq 32$
and $x1, x2 \geq 0$

Q4.

A Write a short note on the **(10)**

i) Steps in Simulation
ii) Applications of Simulation

B Find the optimal strategies and value of the game where pay-off matrix of the two player is given by **(10)**

	Player B			
Player A		B1	B2	B3
	A1	10	5	-2
	A2	13	12	15
	A3	16	14	10

Q5.

A Use Two Phase Simplex Method to solve the following LPP **(10)**

Maximize $Z = 3x_1 - x_2$
subject to $2x_1 + x_2 \geq 2$
$x_1 + 3x_2 \leq 2$
and $x_1, x_2 \geq 0$

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B Customers arrive at a sales counter manned by a single person according to a Poisson process with a mean rate of 20 per hour. The time required to serve a customer has an exponential distribution with a mean of 100 seconds. Find the **(10)**

i. Average waiting time of a customer in the queue
ii. Average number of customers in the system
iii. Probability that a customer is required to wait
iv. Probability that there are at least 4 customers in the system

Q6.

A The owner of a bakery shop has observed the following demand pattern for a particular brand of cakes. **(10)**

Daily Demand	0	10	20	30	40	50
Probability	0.02	0.08	0.15	0.40	0.30	0.05

Every morning he receives fresh cakes and places an order for the next day. The order quantity for next day is equal to the number of cakes he demanded the previous day. Assuming that he receives 30 cakes on the first day and places an order for 30 cakes for the next day, simulate the system for the next 10 days to determine:

i. Average number of cakes sold per day
ii. Probability of stock out on any day
iii. Average number of unsold cakes per day if he does not sell stale cakes
iv. Average profit per day if he earns a profit of Rs.20 per cake and returns unsold cakes the next day with a loss of Rs.10

Random Numbers: 3244, 8857, 9516, 8058, 6047, 9504, 4554, 3172, 8699, 3584

B A salesman has to visit 5 cities A, B, C, D and E. The distance (in 100 kms) between the 5 cities is given below. If the salesman starts from A and has to come back to city A, which route should he select so that the total distance travelled is minimum? **(10)**

		To City				
		A	B	C	D	E
From City	A	0	7	6	8	4
	B	7	0	8	5	6
	C	6	8	0	9	7
	D	8	5	9	0	8
	E	4	6	7	8	0

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Paper / Subject Code: 70652 / Artificial Intelligence & Machin Learning

MCA /Sem-II /2 Yrs. Course/ Jan-2024 (SH2023)

(3 Hours) **Total Marks: 80**

N.B.: 1) Question No.1 is **compulsory.**
2) Attempt any **THREE** from the remaining questions.
3) Figures to the right indicate full marks.

Q1.	**(a)**	Write a short note on Intelligent Agent.	**[05]**
	(b)	Write a note on uninformed search.	**[05]**
	(c)	Discuss Bias/Variance Trade-off	**[05]**
	(d)	What is machine learning, and how does it differ from traditional programming?	**[05]**
Q2.	**(a)**	Explain prepositional logic with suitable example.	**[10]**
	(b)	Discuss in detail the backpropagation algorithm	**[10]**
Q3.	**(a)**	What is heuristic search? Explain any one heuristic searching technique with suitable example.	**[10]**
	(b)	What is supervised learning? Explain in detail the Naïve bayes classifier with an example	**[10]**
Q4.	**(a)**	Describe the key principles behind Ensemble learning. Differentiate between Bagging and Boosting techniques.	**[10]**
	(b)	Discuss in detail the term regression and define logistic regression.	**[10]**
Q5.	**(a)**	Explain in detail the support vector machine.	**[10]**
	(b)	What is the principal component analysis? Explain in detail.	**[10]**
Q6.		Short Note (Solve Any Four)	**[20]**
	a)	Kernal Trick	
	b)	Activation Function	
	c)	Best-First Search	
	d)	Decision Tree Classifier	
	e)	Random Forest	

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Paper / Subject Code: 70653 / Information Security

MCA | Sem-II | 2yrs Course | Jan-2024 (SH2023)

Time: 3 Hours **Max. Marks: 80**

- Q.1 is Compulsory
- Solve any three Questions from Q 2, Q 3, Q 4, Q 5 ,Q 6

Q.1 A) Explain PGP **(5M)**

B) Explain Kerberos. **(5M)**

C) Discuss Digital Certificate **(5M)**

D) Discuss Phone Rootkits. **(5M)**

Q.2 A) Explain Modes of Operation of Block Cipher CBC and OFB in detail. **(10M)**

B) What is SHA -512? Explain SHA- 512 in detail. **(10M)**

Q.3 A) Discuss Inference. What are the various approaches to deal with it? **(10M)**

B) What is Firewall? Discuss its types in detail. **(10M)**

Q.4) A) What is IDS? Explain Statistical Anomaly Detection and Rule based Detection. **(10M)**

B) Explain SSL Handshake Protocol in detail. **(10M)**

Q.5 A) Using Euclidean algorithm, find the greatest common divisor of the following:

i) 74 and 383 ii) 687 and 24 **(10M)**

B) Explain RSA algorithm with example. **(10M)**

Q.6 A) Explain Digital Encryption Standard (DES) in detail. **(10M)**

B) What are the different security services? Explain each in brief with example. **(10M)**

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(3 Hours) [Total Marks: 80]

N.B.: (1) Question No.1 is compulsory

(2) Attempt any THREE Questions between Question No.2 to 6

Q.1.	**Answer *ANY FOUR***	**[20]**
(a)	List IoT Communication APIs and explain them in brief.	
(b)	Differentiate between IoT and M2M.	
(c)	Explain need for IoT security.	
(d)	What is Web of Things? How is it different from Cloud of Things.	
(e)	Explain Role of Big Data Analytics and Wireless Sensor Networks in IoT.	
Q.2.		
(a)	Explain ETSI using suitable diagram.	**[10]**
(b)	Discuss IoT domain model with reference to IoT Reference model.	**[10]**
Q.3.		
(a)	Explain IoT level-1,level-2 and level-3 with help of diagrams.	**[10]**
(b)	Design an IoT system for smart City.	**[10]**
Q.4.		
(a)	Give the steps involved in IoT design methodology and explain function view specification and operation view specification.	**[10]**
(b)	Explain Functional view with reference to IoT Reference Architecture using suitable example.	**[10]**
Q.5.		
(a)	Discuss SOA and cloud computing in IoT	**[10]**
(b)	Explain Cloud of Things Architecture with suitable diagram.	**[10]**
Q.6.		
(a)	Describe how agriculture can be improved using IoT.	**[10]**
(b)	Write short note on BAC Net Protocol and ZigBee.	**[10]**

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TIME:3Hrs **Marks: 80**

N.B.: 1) Question No.1 is **compulsory.**
2) Attempt any **three** from the remaining **five** questions.

1. Write Short Notes on the following:- (20)
   (a) Word Sense Disambiguation
   (b) Ambiguity
   (c) Lemmatization
   (d) Porter's Stemmer

2. (a) What is POS tagging. Explain different techniques of POS tagging. (10)
   (b) Explain lexicon, lexeme and the different types of relations that hold between lexemes. (10)

3. (a) What is Automata? Explain FSA with example. (10)
   (b) Explain different applications of NLP. (10)

4. (a) Derive a top-down, parse tree for the given sentence: (10)
   The angry bear chased the frightened little squirrel.
   Use the following grammar rules to create the parse tree:

S → NP VP	Det → the
NP → Det Nom	Adj→ little | angry | frightened
VP → V NP	N → squirrel | bear
Nom →Adj Nom | N	V → chased

   (b) What is language model? Explain N-Gram language model? (10)

5. (a) Describe Hidden Markov Model (HMM). (10)
   (b) Define Text Summarization and explain its types. (10)

6. (a)Differentiate between inflectional and derivational morphology. (20)
   (b) Explain Text Classification in detail.
   (c) Identify the morphological type (Noun phrase, Verb Phrase, Adjective Phrase) of following sentence segments.
   1. that happy puppy
   2. the brightest
   3. leave Boston in the morning
   4. the building on the corner
   5. a cheap restaurant
   (d) Discuss types of ambiguities in NLP.

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Duration: 3Hours **Total Marks: 80**

Note:

1. **Question No: 01 is compulsory.**
2. **Attempt any three questions from the remining five questions (Q. 2 to Q. 6).**
3. **Figures to the right indicate full marks.**
4. **Answers to sub questions should be answered together.**

Q1 **Solve**

A) Write an algorithm for binary search and analyze the algorithm for its time complexity. **05**

B) Write short note on Natural algorithms. **05**

C) Write Knutt-Morris-Pratt algorithm for String Matching. **05**

D) Explain the process of designing an algorithm. Give characteristics of an algorithm. **05**

Q2 **A)** What do you mean by Dynamic Programming, explain Matrix chain multiplication using dynamic programming approach? **10**

B) Define Greedy knapsack. Find the optimal solution of the Knapsack instance n= 7, M=20, (p1, p2, ……p7) = (8,5,6,7,6,12,3) and (w1, w2, ...w7) = (2,10,8,7,6,4,11). **10**

Q3 **A)** Do Mathematical analysis for Recursive and Non-recursive algorithms using detailed examples. **10**

B) Differentiate quick hull algorithm and Jarvis march algorithm for solving Convex-Hull Problems using Divide and Conquer approach. **10**

Q4 **A)** Simulate Quick sort algorithm using Divide and Conquer approach for the following example 24,36,11,4,5,16,58,54,23,16,10,65,76 **10**

B) Define NP Hard and NP –complete problem and write difference between NP-hard and NP-complete problems with example. **10**

Q5 **A)** Write the algorithm to solve all pair shortest path (Floyd Warshall) using Dynamic Programming with an example. **10**

B) What do you mean by Backtracking? Write and explain algorithm for solving n-Queen problem using Backtracking. **10**

Q6 **A)** What do you mean Least cost search using Branch and Bound? Find the LC branch and bound solution for the 15 puzzles. **10**

B) Write Naïve string-matching algorithm for string matching, solve given string using the same T=cabababcd and P=ababc. **10**

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

N.B. (1) Question No. **1** is **Compulsory.**
(2) Attempt any **three** questions from the remaining **five** questions.
(3) Answers to **sub-questions** should be **grouped** and written **together.**

Q.1	(a)	Explain the concept of on-page optimization.	5
	(b)	What are the characteristics of digital marketing? Explain.	5
	(c)	Explain different methods that can be used for deriving competitive intelligence.	5
	(d)	Why Twitter is important in today's era of digital marketing?	5
Q.2	(a)	How do you build a successful social media strategy?	10
	(b)	Explain the various tools available in mobile marketing.	10
Q.3	(a)	What is the importance of display advertising? Explain the various buying models available in display advertising.	10
	(b)	Explain the different types of Ad Campaigns in Twitter.	10
Q.4	(a)	What is SEO? Explain different SEO phases in detail.	10
	(b)	What is multi-channel attribution? Explain different multi-channel attribution models in detail.	10
Q.5	(a)	Explain the structure of a Facebook ad campaign.	10
	(b)	Why it is important to have LinkedIn presence? Explain LinkedIn content strategy and targeting options in detail.	10
Q.6	(a)	What are the advantages of mobile advertising? Explain the steps involved in mobile app marketing.	10
	(b)	Explain the key metrics associated with web analytics.	10