Hall Ticket Number :										

R-20

Code: 20DF12T

M.C.A. I Semester Supplementary Examinations Aug/Sept 2023

Data Structures and Algorithms

Max. Marks: 60 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 12 = 60 Marks)

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			Marks	CO	BL
		UNIT–I			
1.	a)	Differentiate Linear and Non Linear Data Structures with Examples.	6M	CO1	L2
	b)	Define the term algorithm and state the criteria that the algorithm should satisfy	6M	CO1	L1
		OR			
2.	a)	Explain the role of space complexity in measuring performance of a program	6M	CO1	L2
	b)	Describe about the asymptotic notations	6M	CO1	L2
		UNIT–II			
3.		List the applications of queue and write the algorithm to implement queue using Linked List	12M	CO2	L2
		OR			
4.		Describe the procedure to convert infix expression to postfix form. Convert the infix expression **A+B*C-D/E*H** into its postfix form	12M	CO2	L3
		UNIT–III			
5.		Build the binary tree from the given traversal techniques: In order: g d h b e i a f j c Preorder: a b d g h e i c f j	12M	CO3	L3
		OR			
6.	a)	Explain about Linear Probing with example	6M	CO3	L2
	b)	What is hashing and interpret the need of a good Hash Function	6M	CO3	L2
		UNIT–IV			
7.		Draw the binary search tree whose elements are inserted in the following order: 50, 72, 96, 94, 107, 26, 12, 11, 9, 2, 10, 25, 51, 16, 17, 95. What is the maximum height of a binary search tree containing these nodes?	12M	CO4	L3
		OR			
8.	a)	Explain about DFS graph traversal algorithm with an example	6M	CO4	L2
	b)	Explain about Kruskal's algorithm with an example	6M	CO4	L2
		UNIT–V			
9.	a)	Write an algorithm to perform Linear search. Illustrate it with an example.	6M	CO5	L2
	b)	Trace the quick sort algorithm using 90,77,60, 99,55,88	6M	CO5	L3
		OR			
10.	a)	State and explain selection sort with an example	6M	CO5	L2
	b)	Write an algorithm to implement Insertion Sort and write its efficiency.	6M	CO5	L3

END

Hall Ticket Number :										

R-20

Code: 20DF11T

M.C.A. I Semester Supplementary Examinations Aug/Sept 2023

Mathematical Foundations of Computer Science

Max. Marks: 60 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 12 = 60 Marks)

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			Marks	CO	BL
		UNIT–I			
1.	a)	Construct the truth table for $(P \wedge Q) \vee (P \wedge R)$.	6M	CO1	L3
	b)	Show that $[(P \to Q) \wedge (Q \to R)] \to (P \to R)$ is a tautology	6M	CO1	L2
		OR			
2.	a)	Show that $R \wedge (P \vee Q)$ is a valid conclusion from the premises $P \vee Q, Q \to R, P \to M, and \neg M$	6M	CO1	L2
	b)	Test the validity of the following argument: "If the labour market is perfect, then the wages of all persons in a particular employment will be equal. But it is always the case that wages for such persons are not equal. Therefore the labour market is not perfect".	6M	CO1	L3
		UNIT–II			
3.	a)	Determine whether the relation is compatibility, if $R = \{(1,1),(2,2),(3,3),(1,3),(3,1)\}$ on the set $A = \{1,2,3\}$.	6M	CO2	L3
	b)	Let $R = \{(1,1),(1,2),(2,3),(3,3),(3,4)\}$ be a relation on $A = \{1,2,3,4\}$. Draw the diagraph of R. Obtain R^2 and draw the diagraph of R^2.	6M	CO2	L3
		OR			
4.		Draw the Hasse diagram for the poset $(P(A), \subseteq)$, where $A = \{a, b, c\}$	12M	CO2	L4
		UNIT–III			
5.	a)	In how many different ways 5 men and 5 women can be seated around a table if (i) There is no restriction. (ii) No two ladies sit together.	6M	CO3	L3
	b)	Find the value of n such that $P(n,3) = 3P(n,2)$	6M	CO3	L1
		OR			
6.	a)	Find the coefficient of $x^3y^3z^2$ in the expansion of $(2x-3y+5z)^8$	6M	CO3	L1
	b)	Prove that in a group of 13 persons, at least two persons must have born in the same month.	6M	CO3	L2
		UNIT–IV			
7.	a)	Find the coefficient of x^{20} in $(x^3 + x^4 + x^5 + ---)^5$.	6M	CO4	L3
	b)	Find the generating function for the sequence (0,1,2,3,----)	6M	CO4	L4
		OR			
8.		Solve the recurrence relation by using the characteristic roots method $a_n + 4a_{n-1} + 4a_{n-2} = 8$, $for\ n \geq 2\ given\ a_0 = 1, a_1 = 2.$	12M	CO4	L3
		UNIT–V			
9.	a)	Define (i) Degree of a vertex (ii) Sub Graph (iii) Simple Graph.	6M	CO5	L1
	b)	Prove that complete graph of 5 vertices is non-planar.	6M	CO5	L2
		OR			
10.		Define Minimum Spanning Tree. Explain Kruskal's algorithm with an example.	12M	CO5	L4

END

Hall Ticket Number :										

R-20

Code: 20DC11T

M.C.A. I Semester Supplementary Examinations Aug/Sept 2023

Probability and Statistics

Max. Marks: 60 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 12 = 60 Marks)

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			Marks	CO	BL
		UNIT–I			
1.	a)	The students in a class are selected at random, one after another, for an examination. Find the probability that the boys and girls in the class arranged alternately if (i) The class consists of 4 boys and 3 girls. (ii) The class consists of 3 boys and 3 girls.	6M	1	2
	b)	If a random variablenhas the probability density function $f(x) = \begin{cases} k(x^2-1), -1 \le x \le 3 \\ 0, elsewhere \end{cases}$ find the value of K, and $p\left(\frac{1}{2} \le x \le \frac{5}{2}\right)$	6M	3	1
		OR			
2.	a)	Box A contains 5 red and 3 white marbles and box B contains 2 red and 6 white marbles. If a marble is drawn from each box and it is found to be red. What is the probability that the red ball drawn is from bag B.	6M	1	4
	b)	A random variable X has the following probability distribution			

X	1	2	3	4	5	6	7	8
P(X)	K	2K	3K	4K	5K	6K	7K	8K

Find the value of i) K ii) P(X ≤ 2) 6M 4 6

		UNIT–II			
3.	a)	20% of items produced from a factory are defective. Find the probability that in a sample of 5 chosen at random (i) none is defective (ii) one is defective (iii) $P(1 < X < 4)$.	6M	3	3
	b)	Using recurrence formula find the probabilities when x = 0, 1, 2, 3, 4 and 5; if the mean of the Poisson distribution is 3.	6M	2	2
		OR			
4.	a)	Ten coins are tossed simultaneously. Find the probability of getting at least (i) Seven heads (ii) Six heads	6M	5	1
	b)	The mean and S.D of normal distribution are 70 and 16, find $P(38 < X < 46)$.	6M	2	3
		UNIT–III			
5.		A population consists of 5, 10, 14, 18, 13, 24. Consider all possible samples of size two can be drawn without replacement from the population. Find i) Mean of the population. ii) Standard deviation of the population. iii) The mean of the sampling distribution of means. iv) The Standard deviation of the sampling distribution of means.	12M	3	4
		OR			6
6.	a)	In a sample of 500 from a village in Andhra Pradesh, 280 are found to be rice eaters and rest wheat eaters. Can we assume that the both articles are equally popular?	6M	1	2

b) A manufacturer claimed that at least 95% of the equipment which he supplied to a factory conformed to specifications. An examination of a sample 200npieces of equipment revealed that 18 were faulty. Test his claim at 5% level of significance. 6M 3 1

UNIT–IV

7. a) The manufacturer of certain electric bulbs claims that his bulbs have a mean life of 25 months with S.D of 5 months. A random sample of 6 such bulbs gave the following values. Life of months: 24, 26, 30, 20, 20, 18. Can you regard the producers' claims to be valid at 0.01 level of significance? 6M 2 3

b) Two random samples have the following results.

Sample	Size	Sample mean	Sum of square of deviations from the mean
1	10	15	90
2	12	14	108

Test whether the samples came from the same normal population. 6M 4 4

OR

8. a) A sample of 26 bulbs gives a mean life of 990 hrs with S.D of 20 hrs. The manufacturer claims that the mean life of bulbs is 1000 hrs. Is the sample not up to the standard? 6M 3 2

b) The following table gives the classification of 100 workers according to sex and nature of work. Test whether the nature of work is independent of sex of the worker.

	Stable	Unstable	Total
Males	40	20	60
Females	10	30	40
Total	50	50	100

6M 2 1

UNIT–V

9. Arrivals at a telephone booth are considered to be Poisson, with an average time of 10 minutes between one arrival and the next. The length of a phone call assumed to be distributed exponentially with mean 3 minutes. Then

i) What is probability that a person arriving at the both will have to wait?

ii) What is the average length of the queues that from time to time?

iii) The telephone department will install a second booth convinced that an arrival would expect to have to wait at least three minutes for the phone. By how much must the flow of arrivals be increased in order to justify a second booth? 12M 5 2

OR

10. A bank has one drive in counter. It is essential that cars arrive according to poisson distribution at the rate of 2 every 5 minutes and that there is enough space to a accommodate a line of 10 cars. Other arriving cars can wait outside this space, if necessary. It takes 1.5 minutes on an average to serve a customer, but the service time actually varies according to an exponential distribution Find

i) The proportion of time the facility remains idle.

ii) The expected number of customers waiting but currently not being served at a particular point of time.

iii) The expected time a customer spends in the system and

iv) The probability that the waiting line will exceed the capacity of the space leading to the drive in counter. 12M 2 4

END

Hall Ticket Number :										

R-20

Code: 20DF13T

M.C.A. I Semester Supplementary Examinations Aug/Sept 2023

Relational Database Management Systems

Max. Marks: 60 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 12 = 60 Marks)

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			Marks	CO	BL
		UNIT–I			
1.		Describe data model? What is the relational data model? What is data independence and how does a DBMS support it?	12M	CO1	L2
		OR			
2.	a)	Explain various notations used in Entity-Relationship diagrams with examples	6M	CO1	L2
	b)	Illustrate the extended E-R features	6M	CO1	L3
		UNIT–II			
3.	a)	Explain the fundamental Relational algebra operations	6M	CO2	L2
	b)	Illustrate Tuple relational calculus operations with example queries	6M	CO2	L3
		OR			
4.	a)	Illustrate Domain relational calculus operations with example queries	6M	CO2	L3
	b)	Describe QBE (Query-by-Example) operations with example queries	6M	CO2	L2
		UNIT–III			
5.	a)	Explain briefly about joins and its types with examples?	6M	CO3	L2
	b)	Differentiate between primary key constraint and foreign key constraint?	6M	CO3	L2
		OR			
6.	a)	Differentiate between 3NF and BCNF normal forms with examples.	6M	CO3	L2
	b)	Discuss join dependencies and fifth normal form, and explain why 5NF?	6M	CO3	L2
		UNIT–IV			
7.	a)	Explain ACID properties and Illustrate them through examples?	6M	CO4	L2
	b)	Describe the Transaction state with an example	6M	CO4	L2
		OR			
8.	a)	Explain in detail about storage structure?	6M	CO4	L2
	b)	Explain ARIES Recovery Algorithm	6M	CO4	L2
		UNIT–V			
9.	a)	Explain about Organization of Records in Files	6M	CO5	L2
	b)	Explain the significance of Ordered Indices	6M	CO5	L2
		OR			
10.	a)	Explain about B-Tree Index files	6M	CO5	L2
	b)	Differentiate between Static and Dynamic Hashing	6M	CO5	L2

END

Hall Ticket Number :										

R-20

Code: 20DF14T

M.C.A. I Semester Supplementary Examinations Aug/Sept 2023

Computer Organization

Max. Marks: 60 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 12 = 60 Marks)

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			Marks	CO	BL
		UNIT–I			
1.	a)	Explain the implementation of 16-bit ripple-carry adder using the full adder building blocks	6M	CO1	L2
	b)	Prove that the 2-data input multiplexer is universal by showing how 2-input AND and NOT gates can be implemented using this multiplexer	6M	CO1	L3
		OR			
2.	a)	Explain in detail on the concepts of PAL and PLA	6M	CO1	L2
	b)	Show an implementation of the full adder by using two half-adders and a 2-input OR gate	6M	CO1	L3
		UNIT–II			
3.	a)	Discuss in detail about memory hierarchy in a computer Systems	6M	CO2	L2
	b)	Explain in detail about Typical RAM chip with a schematic	6M	CO2	L2
		OR			
4.	a)	Explain about CACHE memory and its usage	6M	CO2	L2
	b)	Explain in detail about direct mapping cache organization	6M	CO2	L2
		UNIT–III			
5.		Discuss about the addressing modes of 8086 in detail	12M	CO3	L2
		OR			
6.		Discuss in detail about the architecture of 8086	12M	CO3	L2
		UNIT–IV			
7.	a)	Discuss in detail about Shift and rotate instructions	6M	CO4	L2
	b)	Explain in detail about Conditional and unconditional transfer instructions	6M	CO4	L2
		OR			
8.	a)	Explain how is Iteration control undertaken in 8086	6M	CO4	L2
	b)	Discuss on how are Interrupts handles in 8086	6M	CO4	L2
		UNIT–V			
9.		Discuss in detail about the general configuration of a microprogrammed control unit.	12M	CO5	L2
		OR			
10.	a)	What is meant by Control Branching? Explain about the Selection of address for control memory.	6M	CO5	L2
	b)	Explain in detail about Symbolic Microprogram	6M	CO5	L2

******All the Best******