	SRI INDU COLLEGE OF ENGG & TECH **QUESTION BANK** **(Regulation :R20)** **Department of Computer Science Engineering(AIML)**	**(Regulation :R20)** **Prepared on : 28.9.2021** **Rev1:**

Sub. Code & Title	**(R20CSE2201) Discrete Mathematics**		
Academic Year: 2021-22	**Year/Sem.**	**II/I**	
Faculty Name & Designation	**R. Mahendar, ASSISTANT PROFESSOR**		

QUESTION BANK WITH BLOOMS TAXONOMY LEVEL (BTL)

(1. Remembering 2. Understanding 3. Applying 4. Analyzing 5. Evaluating 6. Creating)

UNIT-1 : Introduction			
	1 MARKS QUESTIONS	**BT Level**	**Course Outcome**
1.	Define a Proposition. **June-2018**	2	CO1
2.	Prove the DeMorgan law:~(p^q) $\Longleftrightarrow$ (~p V ~q). **Nov-2019**	1	CO1
3.	Write about the Conditional Statement. **July-2021**	1	CO1
4	Define Disjunction. **Jan-2016**	2	CO1
5	Define Biconditional Statement. **Dec-22019**	1	CO1
6	List two logical connectives. **July-2021**	1	CO2
7	What is Converse Statement?. **May-2020**	3	CO2
8	Write about the Contrapositive Statement. **April-2020**	3	CO2
9	What are Rules of inference?. **Mar-2020**	1	CO2
10	Prove that ,for any propositions **p ,q ,r,** the compound **[(p→q)^(q→r)] →(p→r)** whether it is a **tautology** or not . **Sep-2021**	6	CO2
	10 MARKS QUESTIONS		
1.	State the Laws of Logic.	1	CO1
2.	State and explain the rules for modus pones and modus tollens in rules of inference. **Nov-2018**	4	CO2
3.	Draw the truth table for Conditional statement. **Aug-2021**	4	CO1
4.	Explain logically equivalent statement. **May-2021**	2	CO1
5.	Draw the truth table for Conjunction and explain with an example. **May-2020**	1	CO1,CO2
6.	a. Draw the truth table for Contrapositive and explain with an example. b. Define Tautology. Draw the truth table for tautology. **Sep-2019**	1	CO1

7.	Define and explain Consistency and inconsistency of the premises? **April-2018**	2	CO2
8	Show that R v S follows logically from the premises C v D, (C v D) → ~H, ~H → (A ^ ~B) and (A ^ ~B) → R v S.	3	CO1,CO2
9	a. Test whether the following argument is valid: **July-2019** If I drive to work, then I will arrive tired. Iam not tired (when I arrive at work) ∴ I do not drive to work b.Test whether the following argument is valid: If a person is poor, he is unhappy. If a person is unhappy, he dies young. ∴ Poor persons die young.	3	CO2
10	a) Prove that the premises p →r, q →r, (p ∨ q) →r are consistent. **Sep-2021** b) Prove that [(p V q) ^ ~{~p ^ (~q V ~r)}] V (~p ^ ~q) V(~p ^ ~r) is a tautology.	6	CO1,CO2

Unit -II :

	1 MARKS QUESTIONS	BT Level	Course Outcome
1.	What is Binary relation? **June-2018**	2	CO3
2.	Define Equivalence relation. **Sep-2019**	1	CO3
3.	Define Compatibility relation. **Mar-2020**	1	CO3
4	Write Partial ordering relation? **July-2021**	6	CO3
5	Define Inverse Function. **May-2018**	1	CO3
6	Define Recursive Function. **June-2018**	1	CO3
7	Define Function. **Aug-2021**	1	CO3
8	Defend countable set and uncountable set.	1	CO3
9	Define recursive definition. **Sep-2019**		CO3
10	Write the principle of mathematical induction. **Mar-2018**	3	CO3

10 MARKS QUESTIONS

	SRI INDU COLLEGE OF ENGG & TECH QUESTION BANK (Regulation :R20) Department of Computer Science Engineering(AIML)			(Regulation :R20) Prepared on : 28.9.2021 Rev1:
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1	Let A= {1,2,3,4,5,6,12}. On A, define the relation R by aRb if and only if a divides b, prove that R is a partial order on A. Draw the Hasse diagram for this relation. **Aug-2021**	6	CO3
2.	Explain the properties of Binary relations. **Mar-2019**	2	CO3
3.	Explain the properties of Equivalence relation with example. **Aug-2021**	2	CO3
4.	Define and explain Hasse diagram pictorially with an example. **Aug-2021**	1	CO3
5.	Explain the properties of Partial ordering relation and give two examples. **May-2019**	2	CO3
6.	Explain Compatibility relation with example. **Aug-2018**	2	CO3
7.	Let A= {1, 2, 3, 4} and let R be the relation on A defined by xRy if and only if "x divides y", written X | y. i) Write down R as a set of ordered pairs. **Nov-2019** ii) Draw the diagraph of R. iii)determine in-degree and out-degrees of the each vertex.	6	CO3
8	Consider the following relations on the set A = {1,2,3 } R1 = { (1 ,1), (1 ,2), (1 ,3), (3 ,3) } R2 = { (1 ,1), (1 ,2), (2 ,1), (2 ,2), (3 ,3) } and R3 = { (1,1), (1 ,2), (2 ,2), (2 ,3) }. **Aug-2021** Which of these are i) reflexive, ii) symmetric, iii) transitive, iv) antisymmetric?	1	CO3
9	Let A ={ {1, 2, 3, 4 }, and R = { (1,1), (1 ,2), (2 ,1), (2 ,2), (3 ,1), (3 ,3), (1 ,3), (4 ,1), (4 ,4) } be a relation on A. Is R an equivalence relation? **Aug-2021,Nov-2020**	4	CO3
10	3. Let A = {1,2,3,4,5,6} and B = {6,7,8,9,10}. If a function f:A->B is defined by f= {(1 ,7), (2 ,7), (3 ,8), (4 ,6), (5 ,9), (6 ,9) } determine $f^{-1}(6)$ and $f^{-1}(9)$. If B_1 = {7,8 } and B_2 = {8,9,10}, $f^{-1}(B_1)$ and $f^{-1}(B_2)$. **June-2020**	3	CO3

Unit -III :

	1 MARKS QUESTIONS	BT Level	Course Outcome
1.	Describe an algorithm for finding the maximum (largest) value in a finite sequence of integers. **June-2020**	1	CO4
2.	To search for 19 in the list	6	CO4
3.	Use the bubble sort to put 3, 2, 4, 1, 5 into increasing order.	1	CO4
4	Use the insertion sort to put the elements of the list 3, 2, 4, 1, 5 in increasing order. **Dec-2018**	6	CO4
5	Show that f (x) = x2 + 2x + 1 is O(x2). **Jan-2017**	2	CO4
6	How can big-O notation be used to estimate the sum of the first n positive integers? **Nov-2019**	1	CO4

7	Suppose that f1(x) and f2(x) are both O(g(x)). Then (f1 + f2)(x) is O(g(x)). **Jun-2020**	2	CO4
8	Show that 3x2 + 8x log x is (x2). **May-2019**	1	CO4
9	Show that if n is a positive integer, then 1 + 2 +···+ n = n(n + 1)/2 . **Aug-2021**	5	CO4
10	Conjecture a formula for the sum of the first n positive odd integers. Then prove your conjecture using mathematical induction. **Nov-2019**	1	CO4
	PART-B		
	10 MARK QUESTIONS		
1.	List all the steps used to search for 9 in the sequence 1, 3, 4, 5, 6, 8, 9, 11 using a) a linear search. b) a binary search. **Mar-2020**	5	CO4
2	Use the bubble sort to sort d, f, k, m, a, b, showing the lists obtained at each step. **June-2020**	1	CO4
3.	Sort these lists using the selection sort. a) 3, 5, 4, 1, 2 b) 5, 4, 3, 2, 1 c) 1, 2, 3, 4, 5. June-2018	6	CO4
4	a. Show all the steps used by the binary insertion sort to sort the list 3, 2, 4, 5, 1, 6. b. Compare the number of comparisons used by the insertion sort and the binary insertion sort to sort the list 7, 4,3, 8, 1, 5, 4, 2. Dec-2019	3	CO4
5.	Give big-O estimates for the factorial function an-d the logarithm of the factorial function, where the factorial function f (n) = n! is defined Nov-2020	3	CO4
6	Give a big-O estimate for f (x) = (x + 1) log(x2 + 1) + 3x2. May-2019	5	CO4
7.	Use mathematical induction to show that 1 + 2 + 22 +···+ 2n = 2n+1 – 1 for all nonnegative integers n. June-2018	5	CO4
8.	Suppose that f is defined recursively by f (0) = 3, f (n + 1) = 2f (n) + 3. Find f (1), f (2), f (3), and f (4). Jan-2021	3	CO4
9.	Give a recursive definition of an, where a is a nonzero real number and n is a nonnegative integer. Dec-2018	4	CO4
10.	Show that whenever n ≥ 3, fn> αn−2, where α = (1 + √5)/2. June-2019	3	CO4

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Sub. Code & Title	**(R20CSE2201) Discrete Mathematics**		
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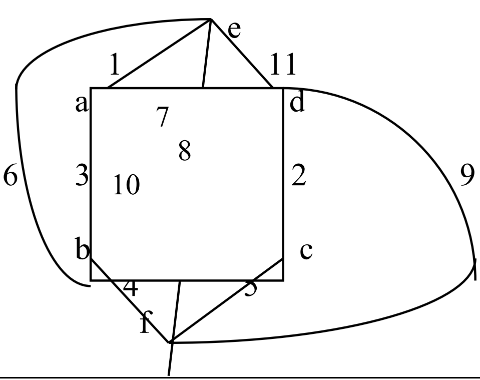
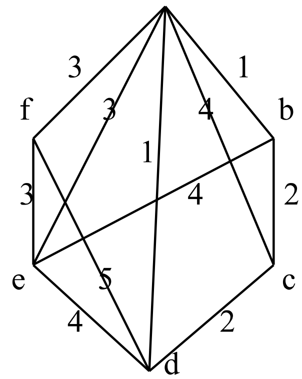
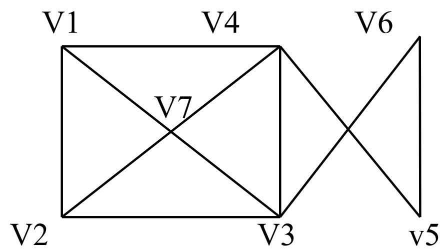
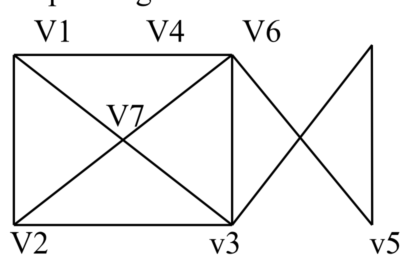
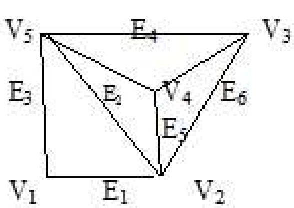
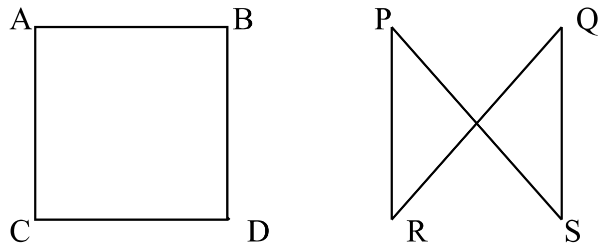
Faculty Name & Designation	**R. Mahendar, ASSISTANT PROFESSOR**		

Unit-IV :			
	1 MARKS QUESTIONS	**BT Level**	**Course Outcome**
1.	What is the solution of the recurrence relation $an = 6an-1 - 9an-2\ witha0 = 1,1 = 6$. **June-2018**	5	CO5
2.	Find the recurrence relation of the sequence $(n) = an, \geq 1$. **Nov-2019**	1	CO5
3.	Find the number of non-negative integer solutions of the equation $1 + x2 + x3 = 11$. **July-2021**	6	CO5
4	Determine whether the sequence $\{an\}$ is a solution of the recurrence relation$an = 2an-1 - an-2$, n=2, 3, 4, … where $an = 3n$ for every non negative integer n. **May-2021**	5	CO5
5	What is the solution of the recurrence relation $an = 6an-1 - 9an-2\ witha0 = 1,1 = 6$. **April-2020**	5	CO5
6	Use mathematical induction to show that $n! \geq 2n+1$, $= 1,2,3,\ldots$ **Mar-2020**	2	CO5
7	Use mathematical induction to show that $1 + 2 + 3 + \cdots + n = (n+1)\ 2$. **Sep-2021**	2	CO5
8	State the principle of strong induction. **Aug-2019**	1	CO5
9	Find the recurrence relation for the Fibonacci sequence. **May-2018**	1	CO5
	10 MARKS QUESTIONS		
1.	Using induction principles prove that $n3 + 2n$ is divisible by 3. **Sep-2021**	3	CO5
2.	Prove by mathematical induction that $12 + 22 + 32 + \cdots + n2 = (n + 1)(2n + 1)\ 6$. **July-2019**	1	CO5
3.	Let m be any odd positive integer. Then prove that there exist a positive integer n such that m divides $2n - 1$. **April-2018**	1	CO5
4.	Solve the recurrence relation $an = -3an-1 - 3an-2 - an-3$ with $a0 = 5,1 = -9\ anda2 = 15$. **Sep-2019**	3	CO5
5.	Find the solution to the recurrence relation$an = 6an-1 - 11an-2 + 6an-3$ with initial conditions$a0 = 2,1 = 5\ anda2 = 15$. **May-2020**	1	CO5
6.	Solve the recurrence relation $an+1 - an = 3n2 - n, n \geq 0, a0 = 3$. **May-2021**	1	CO5
7.	Use the method of generating function to solve the recurrence relation $an = 4an-1 - 4an-2 + 4n;\ n \geq 2\ giventhata0 = 2\ anda1 = 8$. **Aug-2021**	3	CO5
8.	Solve the recurrence relation $= 3an-1 + 2, n \geq 1, witha0 = 1$ by the method of generating function. **Sep-2021**	5	CO5

9.	Find all solutions of the recurrence relation $an - 2an{-}1 = 2n2, \geq 1, a1 = 4$. **Mar-2020**	5	CO5
	Unit-V		
	1 MARKS QUESTIONS	**BT Level**	**Course Outcome**
1.	1. Define a Graph. 2. Define a Sub graph with examples**. June-2018**	2	C O 5
2.	Define a Digraph.**Sep-2019**	2	CO5
3.	Define a Cycle graph. **July-2021**	2	CO5
4	Define planar graphs. **May-2018**	1	CO5
5	What are the various types of graph? **Aug-2021**	1	CO5
6	Define a Bipartite and complete bipartite graph with one example. **Sep-2019**	3	CO5
7	What is connected graph and disconnected graph? **Mar-2018**	4	CO5
8	What is a Spanning tree? **Mar-2020**	1	CO5
9	a. Define a Sub graph with examples**. Aug-2021**	1	CO5
10	a. Define graph Isomorphism. **May-2018** b. Distinguish betweenEuler path and Euler circuit?	5	CO5
	10 MARKS QUESTIONS		
1.	a) Explain about Kruskal's algorithm. b) Find the minimal spanning tree by using Kruskal's algorithm for the following given graph. **Mar-2019** 	6	CO5
2.	What is a planar graph? Mention the properties of a planar graph. **June-2020**	4	CO5
3.	a. Explain about Prim's algorithm. **Dec-2019** b. Find the minimal spanning tree by using prim's algorithm for the following given graph.	6	CO5

	a 		
4.	a) Explain DFS algorithm. b) Apply a BFS algorithm to find a spanning tree. **Aug-2021** 	3	CO5
5.	a. write all the steps of BFS algorithm. What is a weighted graph? **Aug-2021**	2	CO5
6.	a) Draw a complete binary tree with 19 vertices. b) A complete binary tree has 25 leaves. How many vertices does it have? **Jan-2017**	6	CO5
7.	a) Explain BFS algorithm. b) Apply a DFS algorithm to find a spanning tree. **Dec-2020** 	3	CO5
8.	Show that the maximum number of edges in a complete biparticle graph with 'n' vertices is n2/4. **Aug-2019**	6	CO5
9.	Find an Eulerian cycle in the graph. **May-2020** 	6	CO5
10.	a) Explain about Isomorphism. b) Show that following graphs are Isomorphic or not. **May-2020, July-2021**	6	C O5

Model Paper-1

D4

BR-20

Subject Code:(R20CSE2201)

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi)

Recognized under 2(f) and 12(B) of UGC Act 1956

II B.Tech - I Semester –End Examinations (Regular) May - 2021

Discrete mathematics

Computer Science and Engineering(AI&ML)

Duration:3Hrs **Max Marks:70M**

Section – A

Answer *All*thefollowingquestions **Marks: 5Qx4M =20M**

1. Construct the truth table for the compound proposition
   $(p \to q) \leftrightarrow (\neg p \to \neg q)$.
2. Construct the truth table for the compound proposition$(p \to q) \to (q \to p)$.
3. When do you say that two compound propositions are equivalent
4. Let A= {1,2,3,4,5,6,12}. On A, define the relation R by aRb if and only if a divides b, prove that R is a partial order on A. Draw the Hasse diagram for this relation.
5. Define and explain Hasse diagram pictorially with an example

Answer any *FIVE*questions choosing at least one from each Unit

Marks: 5Qx10M = 50M

UNIT - I

6. a).Prove that $((p \vee q) \wedge \neg(\neg p \wedge (\neg q \vee \neg r))) \vee (\neg p \wedge \neg q) \vee (\neg p \wedge \neg r)$ is atautology

b). Show that $(\neg P \wedge (\neg Q \wedge R)) \vee (Q \wedge R) \vee (P \wedge R) \Leftrightarrow R$ without using truttable.

(OR)

7. a) $\forall x(P(x) \to \neg Q(x))$ follows from the premises $\exists x(P(x) \wedge Q(x)) \to \forall y(R(y) \to S(y))$ and $\exists y(R(y) \wedge \neg S(y))$

   b) Prove that $\sqrt{2}$ is irrational by giving a proof by contradiction.

UNIT - II

8. a) Consider the following relations on the set A = {1,2,3 }
   R1 = { (1 ,1), (1 ,2), (1 ,3), (3 ,3) }   R2 = { (1 ,1), (1 ,2), (2 ,1), (2 ,2), (3 ,3) }
   and R3 = { (1,1), (1 ,2), (2 ,2), (2 ,3) }. Which of these are
   i) reflexive, ii) symmetric, iii) transitive, iv) antisymmetric?

   b) Let A ={ {1, 2, 3, 4 }, and R = { (1,1), (1 ,2), (2 ,1), (2 ,2), (3 ,1), (3 ,3), (1 ,3), (4 ,1), (4 ,4) } be a relation on A. Is R an equivalence relation?(.

(OR)

9. a) Let S={1,2,3} and p(s),the power set of S. on p(s),define the relation R by XRY if and only if X $\subseteq$ Y. show that this relation is a partial order on P(s).Draw its Hasse diagram.

   b) Let A = {1,2,3,4,5,6} and B = {6,7,8,9,10}. If a function f:A->B is defined by f= {(1 ,7),(2 ,7), (3 ,8), (4 ,6), (5 ,9), (6 ,9) } determine $f^{-1}(6)$ and $f^{-1}(9)$. If B_1 = {7,8 } and B_2 = {8,9,10}, $f^{-1}(B_1)$ and $f^{-1}(B_2)$.

UNIT - III

10. a) To search for 19 in the list
1 2 3 5 6 7 8 10 12 13 15 16 18 19 20 22, The Binary Search Algorithm.
b) Use the insertion sort to put the elements of the list 3, 2, 4, 1, 5 in increasing order.

(OR)

11. a) Sort these lists using the selection sort.(Creating)
1) 3, 5, 4, 1, 2
2) 5, 4, 3, 2, 1
3) 1, 2, 3, 4, 5.

b). Suppose that f is defined recursively by
f (0) = 3,
f (n + 1) = 2f (n) + 3.

Find f (1), f (2), f (3), and f (4).

UNIT -IV

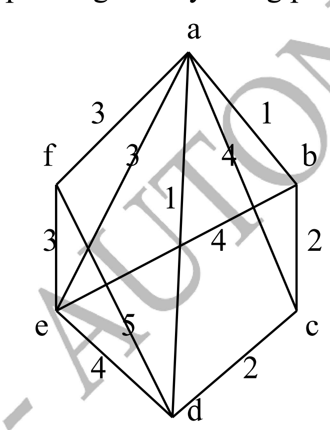
12.a) Using induction principles prove that $n3 + 2n$ is divisible by 3
b) Solve the recurrence relation $an = -3an-1 - 3an-2 - an-3$ with $a0 = 5$, $a1 = -9$ $anda2 = 15$.

(OR)

13.a)Use the method of generating function to solve the recurrence relation
$an = 4an-1 - 4an-2 + 4n$; $n \geq 2$ $giventhata0 = 2$ $anda1 = 8$.
b) Find all solutions of the recurrence relation $an - 2an-1 = 2n2, \geq 1, a1 = 4$..

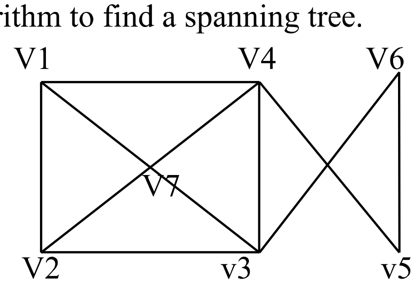
UNIT - V

14. a) Explain about Prim's algorithm.
b). Find the minimal spanning tree by using prim's algorithm for the following given graph.



(OR)

15. a) Explain BFS algorithm(understanding)
b) Apply a DFS algorithm to find a spanning tree.



Model Paper-2 D4

BR-20
Subject Code: (R20CSE2201)

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi)
Recognized under 2(f) and 12(B) of UGC Act 1956

II B. Tech - I Semester –End Examinations (Regular/Suppl.) May - 2021
Discrete Mathematics
Computer Science and Engineering(AI&ML)

Duration:3Hrs **Max Marks:70M**

Section – A

Answer _All_ the following questions **Marks: 5Qx4M =20M**

1. Write the negation of the statement $(\exists x)(\forall y)P(x, y)$..
2. Give an indirect proof of the theorem " If 3n + 2 is odd, then n is odd..
3. Use mathematical induction to show that $1 + 2 + 3 + \cdots + n = n(n+1)/2$.
4. Define complete graph and draw K5.
5. Suppose that f is defined recursively by $f(0) = 3, f(n + 1) = 2f(n) + 3$.

Find f (1), f (2), f (3), and f (4).

Section – B

Answer any _FIVE_ questions choosing at least one from each Unit

Marks: 5Qx10M = 50M

UNIT - I

6. a) When do you say that two compound propositions are Equivalent ?
   b) Without using truth table show that $p \to (q \to p) \Leftrightarrow \neg p \to (p \to q)$.

(OR)

7. a) Prove that $((p \lor q) \land \neg(\neg p \land (\neg q \lor \neg r))) \lor (\neg p \land \neg q) \lor (\neg p \land \neg r)$ is a tautology.
   b) Without constructing the truth tables, obtain the principle disjunctive normal form of $(\neg p \to r) \land (q \leftrightarrow r)$?

UNIT - II

8. a) Let A= {1, 2} and B = { p, q, r, s} and let the relation R from A to B be defined by R = { (1,q), (1,r), (2,p), (2,q), (2,s)}. Write down the matrix of R.
   b) Let A ={ {1, 2, 3, 4 }, and R = { (1,1), (1 ,2), (2 ,1), (2 ,2), (3 ,1), (3 ,3), (1 ,3), (4 ,1), (4 ,4) } be a relation on A. Is R an equivalence relation?

(OR)

9. a) Let a={1, 2, 3} and b= {2, 4, 5}. Determine the following: i) |AxB| ii) Number of relations from A to B iii) Number of binary relations on A
   b) Explain the properties of Binary relations.

UNIT - III

10. a) Show that whenever $n \geq 3$, $f_n > \alpha^{n-2}$, where $\alpha = (1 + \sqrt{5})/2$.
    b)Use the bubble sort to sort d, f, k, m, a, b, showing the lists obtained at each step

(OR)

11. a)Show all the steps used by the binary insertion sort to sort the list 3, 2, 4, 5, 1, 6.(Applying)

b)Compare the number of comparisons used by the insertion sort and the binary insertion sort to sort the list 7, 4,3, 8, 1, 5, 4, 2

UNIT - IV

12. a) Determine whether the sequence $\{an\}$ is a solution of the recurrence relation $an = 2an{-}1 - an{-}2$, n=2, 3, 4, … where $an = 3n$ for every non negative integer n.
    b). Find the recurrence relation for the Fibonacci sequence.

(OR)

13. a) Using induction principles prove that $n3 + 2n$ is divisible by 3.
    b) Prove by mathematical induction that $12 + 22 + 32 + \cdots + n2 = (n + 1)(2n + 1)\ 6$.

UNIT-V

14. a) How many edges are there in a graph with 10 vertices each of degree 6?.
    b) Define isomorphism of directed graph?

(OR)

15. a) Let m be any odd positive integer. Then prove that there exist a positive integer n such that m divides $2n$– 1.
    b) For which values of n do the graphs Kn and Cnhave an Euler path but no Euler circuit??

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Mid-1 Model Paper

BR-20
Subject Code: (R20CSE2201)

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi)
Recognized under 2(f) and 12(B) of UGC Act 1956

II B. Tech - I Semester –End Examinations (Regular/Suppl.) May - 2021

Discrete Mathematics

Computer Science and Engineering(AI&ML)

Duration:90 Min **Max Marks:25M**

Section – A

Answer *All* the following questions **Marks: 5Qx1M =5M**

1 .Define a Proposition

2. Write about the Contra positive Statement
3. Define Equivalence relation
4. Define Function
5. Describe an algorithm for finding the maximum (largest) value in a finite sequence of integers

Section – B

Answer any *FIVE* questions choosing at least one from each Unit

Marks: 6Qx5M = 20M

1. Draw the truth table for Contra positive and explain with an example.
2. Is $\neg p \wedge (p \vee q)) \rightarrow q$ a tautology
3. Let A= {1,2,3,4,5,6,12}. On A, define the relation R by aRb if and only if a divides b, prove that R is a partial order on A. Draw the Hasse diagram for this relation
4. Consider the following relations on the set A = {1,2,3 }
   R1 = { (1 ,1), (1 ,2), (1 ,3), (3 ,3) } R2 = { (1 ,1), (1 ,2), (2 ,1), (2 ,2), (3 ,3) }
   and R3 = { (1,1), (1 ,2), (2 ,2), (2 ,3) }.
   Which of these are i) reflexive, ii) symmetric, iii) transitive, iv) anti symmetric?
5. Show that if n is a positive integer, then1 + 2 +⋯+ n = n(n + 1)/2
6. Sort these lists using the selection sort.(Creating)
   a) 3, 5, 4, 1, 2
   b) 5, 4, 3, 2, 1
   c) 1, 2, 3, 4, 5

D4

Mid-2 Model Paper

BR-20
Subject Code: (R20CSE2201)

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi)
Recognized under 2(f) and 12(B) of UGC Act 1956

II B. Tech - I Semester –End Examinations (Regular/Suppl.) May - 2021

Discrete Mathematics

Computer Science and Engineering(AI&ML)

Duration:90 Min **Max Marks: 25M**

Section – A

Answer *All* the following questions **Marks: 5Qx1M =5M**

1. What are Rules of inference?
2. Write about the Contra positive Statement
3. Define Inverse Function
4. Define recursive definition
5. How can big-O notation be used to estimate the sum of the first n positive integers

Section – B

Answer any *FIVE* questions choosing at least one from each Unit

Marks: 6Qx5M = 20M

6. Show that $(p \rightarrow (q \rightarrow r)) \rightarrow ((p \rightarrow q) \rightarrow (p \rightarrow r))$ is a tautology.
7. Without using truth table show that $\rightarrow (q \rightarrow p) \Leftrightarrow \neg p \rightarrow (p \rightarrow q)$.
8. Let A = {1,2,3,4,5,6} and B = {6,7,8,9,10}. If a function f:A->B is defined by f= {(1 ,7), (2 ,7), (3 ,8), (4 ,6), (5 ,9), (6 ,9) } determine $f^{-1}(6)$ and $f^{-1}(9)$. If B_1 = {7,8 } and B_2 = {8,9,10}, $f^{-1}(B_1)$ and $f^{-1}(B_2)$.
9. Let A ={ {1, 2, 3, 4 }, and R = { (1,1), (1 ,2), (2 ,1), (2 ,2), (3 ,1), (3 ,3), (1 ,3), (4 ,1), (4 ,4) } be a relation on A. Is R an equivalence relation?
10. Use the bubble sort to put 3, 2, 4, 1, 5 into increasing order.
11. Suppose that f is defined recursively by
    f (0) = 3,f (n + 1) = 2f (n) + 3.
    Find f (1), f (2), f (3), and f (4).