RV College of Engineering®
Mysore Road, RV Vidyaniketan Post,
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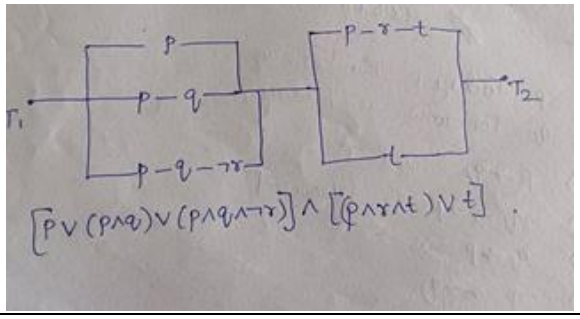
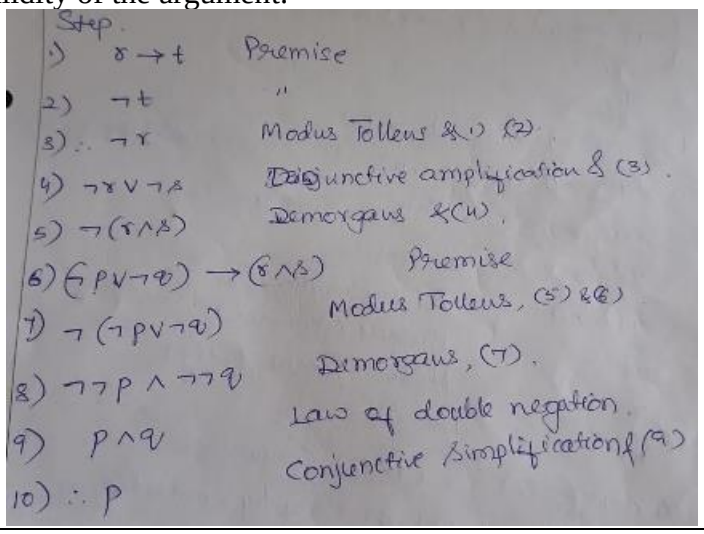
Academic year 2023-2024 (Even Sem)
DEPARTMENT OF

COMPUTER SCIENCE & ENGINEERING

Date	June 2024	Maximum Marks	50
Course Code	CS241AT	Duration	90 Min
Sem-IV	**Test-1- Scheme and Solution**	Staff: HKK/ASP/SMS/SGR/MNV	

DISCRETE MATHEMATICAL STRUCTURES AND COMBINATORICS
(Common to CSE, ISE & AIML)

		Marks	BT	CO
1a.	Determine if the expansion of $\left(x^2 - \frac{2}{x}\right)^{18}$ will contain a term containing x^{10}. **Ans:** $x^{10} = x^{38-3r}$. So, r=28/3 not an integer. So, there will not be a term containing x^{10} in the expansion.	5	4	2
1b.	If a person places 6 letters into 6 addressed envelopes, what is the probability that exactly two of them are placed correctly. **Ans:** **Total arrangements = 6!=720** **Exactly 2 are placed correctly = 6C2xD4=6C2x9=135** **Required probability= 135/720= 3/16**	5	3	2
2a.	Find the number of non negative integer solutions of • $x_1+ x_2 + x_3 + x_4 + x_5 = 40$ **44C40** • $x_1+ x_2 + x_3 + x_4 + x_5 \leq 40$ **45C40** • $x_1+ x_2 + x_3 + x_4 + x_5 = 40$ with $x_1 \geq 1$, $x_2 \geq 2$, $x_3 \geq 3$, $x_4 \geq 4$, $x_5 \geq 5$ **29C4** • $x_1+ x_2 + x_3 + x_4 + x_5 = 40$ with $x_1 < 20$ **44C40 - 24C20**	6	3	2
2b.	Simplify using the laws of logic: ¬[¬{(p v q) ^ r} v ¬q] **Ans:** q ^ r	4	3	1
3a.	Write the recurrence relation to solve the Tower of Hanoi problem. Also solve that recurrence relation using generating function. **Ans:** Recurrence relation is $a_n = 2a_{n-1} + 1$, $a_0 = 0$ Solution is $a_n = 2^n - 1$, $n \geq 0$	6	4	4
3b.	Draw the circuit diagram to represent the following statement: [p v (p ^ q) v (p ^ q ^ ¬r)] ^ [p ^ r ^ t) v t] 	4	2	3

4a.	If a person invests ₹ 25,000 at at 9% annual interest, find the amount he will get at the end of 5 years if i. interest compounded half yearly $p_n=(1.045)^n p_0$ **₹38824.2** ii. interest compounded monthly $p_n=(1.0075)^n p_0$ **₹39142.4** Write the recurrence relation to solve.	6	3	4
4b.	Determine the truth values of p, q, r, s, t when $[p \wedge (q \wedge r)] \rightarrow (s \veebar t)$ is false. **Ans:** p=q=r=1, s=t=0 or p=q=r=1, s=t=1	4	2	1
5a.	Show the validity of the argument:  	6	3	3
5b.	Find the number of ways in which 5 people A, B, C, D, and E can be seated at a round table, such that i. C and D always sit together 3!*2=6*2=12 ii. C and D never sit together 4!-3! = 24-12=12	4	1	1

BT-Blooms Taxonomy, CO-Course Outcomes, M-Marks

Marks Distribution	Particulars	CO1	CO2	CO3	CO4	CO5	L1	L2	L3	L4	L5	L6
	Max Marks									-	-	-

Course Outcomes:

1.	Apply the concepts of discrete mathematical structures for effective computation and relating problems in the computer science domain.
2.	Analyze the concepts of discrete mathematics to various fields of computer science.
3.	Design solutions for complex problems using different concepts of discrete mathematical structure as a logical predictable system.
4.	Explore/Develop new innovative ideas to solve some open problems in theoretical computer science.
5.	Effectively communicate, work in groups in order to accomplish a task and engage in continuing professional development.

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