Register No.: .... Name: ....

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIRST SEMESTER M.TECH DEGREE EXAMINATION (Regular), DECEMBER 2023

COMPUTER SCIENCE AND SYSTEMS ENGINEERING

(2021 Scheme)

Course Code: **21SE101**

Course Name: **Discrete Structures for Computer Science**

Max. Marks: **60** **Duration: 3 Hours**

PART A

(Answer all questions. Each question carries 3 marks)

1. Let A ={1,2,3,4} give an example of a relation which is Reflexive, Symmetric and not Transitive.
2. Define a lattice. Give example.
3. If I get selected in IAS exam then I will not be able to go to London. Since I am going to London, I will not get selected in IAS exam. Represent the above statement in symbolic form.
4. In how many ways can the letters of the word 'ARRANGE' be arranged such that the two R's do not occur together.
5. Write any 2 subgroups of Z_8.
6. Prove that a group G is abelian iff $(ab)^{-1} = a^{-1} b^{-1}$
7. Define a ring with an example.
8. Find the multiplicative inverse of 3,8 and 10 in $< Z_{11} , +, X >$

PART B

(Answer one full question from each module, each question carries 6 marks)

MODULE I

9. Let Z be the set of all integers, R be the relation congruence modulo 5 defined by R= { (x, y)/x, y ∈ Z & x-y is divisible by 5}. Show that R is an Equivalence relation. Determine the equivalence class and partition of Z induced by R. (6)

OR

10. Let A={ 1,2,3,...,12} and R be a relation defined in A x A by (a, b) R (c, d) if and only if a+ d = b+ c. Prove that R is an equivalence relation. Also find the equivalence class of (2, 3). (6)

MODULE II

11. Define a Poset. Let S be any set and P(S) be the power set of S. R={(A,B) : A, B ∈ P(S) and A⊆ B}. Prove that (P(S), R) is a Poset. (6)

OR

12. Draw the Hasse Diagram of (D_{42}, /). Find the compliment of each element in D_{42}. (6)

MODULE III

13. Show that $(p \wedge q) \leftrightarrow (\neg p \vee \neg q)$ is a contradiction. (6)

OR

14. Show that the argument is valid without using truth table. (6)
"If today is Tuesday, I have test in Maths or Economics. If my Economics Professor is sick, I did not have a test in Economics. Today is Tuesday and my Economics professor is sick. Therefore I have a test in Maths

MODULE IV

15. Let X be the binomial random variable that consists the number of success, each with probability p, among n, Bernoulli trials. Prove that E(x)= np. (6)

OR

16. Find the number of arrangements in the word TALLAHASSEE. How many arrangements have no adjacent A' s. (6)

MODULE V

17. Prove that every subgroup of a cyclic group is cyclic. (6)

OR

18. State and prove Lagrange's Theorem on Groups (6)

MODULE VI

19. Determine whether $< Z,\oplus.\odot >$ is a ring with binary operation $x\oplus y= x+y-7$ and $x\odot y= x+y-3xy$ for every x,y in Z. (6)

OR

20. Determine the multiplicative inverse of $\begin{bmatrix} 1 & 2 \\ 3 & 7 \end{bmatrix}$ in the ring $M_2(Z)$. (6)

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