

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIRST SEMESTER M. TECH DEGREE EXAMINATION
Computer Science and System Engineering
04CS6401—Discrete structures for Computer Science

Max. Marks : 60

Duration: 3 Hours

PART A

Answer All Questions

Each question carries 3 marks

1. Prove the identity $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$
2. Define Complete Lattice with an example
3. Find the number of permutations of the letter of the word “MATHEMATICS”
4. Derive the expectation of Binomial distribution with parameters n and p.
5. Define a cyclic group and prove that every cyclic group is abelian.
6. Write the order of every element in $(\mathbb{Z}_8, +)$
7. State and Prove Lagrange’s theorem on Groups
8. Find the multiplicative inverse of the matrix $\begin{bmatrix} 1 & 2 \\ 3 & 7 \end{bmatrix}$ in the ring $M_2(\mathbb{Z})$.

PART B

Each question carries 6 marks

9. Prove that if functions $f: A \rightarrow B$, $g: B \rightarrow C$ are invertible then $g \circ f: A \rightarrow C$ is also invertible and $(g \circ f)^{-1} = f^{-1} \circ g^{-1}$

OR

10. Let $f: \mathbb{R} \rightarrow \mathbb{R} - \{0\}$ defined by $f(x) = \frac{1}{x}$. Show that f is bijective and find the inverse.

11. Explain Mathematical induction. Hence Show that $1+2+3+\dots+n = \frac{n(n+1)}{2}$ for all natural numbers n.

OR

12. Define Partial ordering Relation. Let $x, y \in \mathbb{Z}$, the modulo n relation R is defined by xRy if $x-y$ is multiple of n, Check whether R is a partial ordering relation .

13. Explain soundness of propositional logic.

OR

14. Test the validity of an argument- “If I will select in IAS exam, then I will not be able to go to London. Since I am going to London, I will not select in IAS exam”

15. Determine the co-efficient of $x^2y^2z^3$ in the expansion of $(x + y + z)^7$

OR

16. Out of 200 families with 4 children each how many would you expect to have (a) atleast one boy (b)1 or 2 girls.

17. Check whether the set of all non singular $n \times n$ matrices with integer entries under matrix Multiplication is a group

OR

18. a. Prove that a group is abelian if and only if $(a \cdot b)^{-1} = a^{-1} \cdot b^{-1}$
b. Prove that inverse of every element in a group is always unique.

19. Check whether $(\mathbb{Z}_5, +_5, \times_5)$ is a Commutative Ring with unity. Is $(\mathbb{Z}_n, +_n, \times_n)$ a Field for every n . Justify your answer.

OR

20. Is the element 25 a unit in \mathbb{Z}_{72} . If so find the multiplicative inverse.