



WEST BENGAL STATE UNIVERSITY
B.A./B.Sc. Honours 3rd Semester Examination, 2021-22

CMAACOR07T-COMPUTER APPLICATION (CC7)

DISCRETE STRUCTURE

Time Allotted: 2 Hours

Full Marks: 50

*The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.*

GROUP-A

1. Answer any **five** questions from the following: 2×5 = 10
- (a) State the principle of Inclusion and Exclusion for three sets A , B and C .
 - (b) Define Big Omega notation. Give its geometrical interpretation.
 - (c) Define Complete Graph.
 - (d) Define Bipartite Graph.
 - (e) When a proposition is called contingency?
 - (f) Define equivalence relation.
 - (g) Define Pigeonhole Principle.
 - (h) When a function is called bijective?

GROUP-B

Answer any four questions from the following 10×4 = 40

2. (a) Prove that $P(n) = 1^3 + 2^3 + 3^3 + \dots + n^3 = \{1 + 2 + 3 + \dots + n\}^2$, 5
where $n \geq 1$, solve by mathematical induction.
- (b) Prove that $5^n - 1$ is divisible by 4 for $n \geq 1$, solve by mathematical induction. 5
3. (a) If $f: A \rightarrow B$ and $g: B \rightarrow C$ are one-to-one functions, then prove that 5
 $(g \circ f)^{-1} = f^{-1} \circ g^{-1}$.
- (b) When is a relation called a partial ordering? If a and b are positive integers, $a|b$ means that a is a divisor of b , i.e., $b = ac$ for some integer c , show that " $|$ " is a partial ordering of the set of positive integers. 5

4. (a) Prove using mathematical induction that for all $n \geq 1$, 4

$$1 + 4 + 7 + \dots + (3n - 2) = n(3n - 1)/2$$
- (b) Three students are selected at random from a class of 12 boys and 8 girls. Find out the probability that they are all boys. 4
- (c) If p is "It is Cold" and q is "It is raining" then state the meaning of $q \vee \neg p$. 2
5. (a) Prove that a simple graph with n vertices and k components can have at most $(n - k)(n - k + 1)/2$ edges. 5
- (b) Prove that a given connected graph G is Euler graph if and only if all vertices of G are of even degree. 5
6. (a) Show that $(\neg q \wedge (p \rightarrow q)) \rightarrow p$ is a tautology. 4
- (b) Explain quantifiers with example. 2
- (c) Explain Hamiltonian path with example. 4
7. (a) Show that $\neg (p \vee (\neg p \wedge q)) \equiv \neg p \wedge \neg q$ [Use logical equivalence laws]. 5
- (b) A bag contains 10 red marbles, 10 white marbles and 10 blue marbles. What is the minimum number of marbles you have to choose randomly from the bag to ensure that we get 4 marbles of the same colour? 5

N.B. : *Students have to complete submission of their Answer Scripts through E-mail / Whatsapp to their own respective colleges on the same day / date of examination within 1 hour after end of exam. University / College authorities will not be held responsible for wrong submission (at in proper address). Students are strongly advised not to submit multiple copies of the same answer script.*

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