WEST BENGAL STATE UNIVERSITY

B.A./B.Sc. Honours 3rd Semester Examination, 2020, held in 2021

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) Give an example of planar and non-planar graph.

   (b) Define Isomorphic graph with an example.

   (c) What is tree?

   (d) What is path?

   (e) Define Euler graph.

   (f) What is tautology?

   (g) What is the no. of regions in a connected planar simple graph with 20 vertices each with a degree of 3?

   (h) Define Pigeonhole Principle.

GROUP-B

Answer any *five* questions from the following 8×5 = 40

2. (a) Define the following with example 2+2+2

   (i) Homeomorphic graph.

   (ii) Complete bipartite graph.

   (iii) Cut vertex.

   (b) What is the number of vertices in an undirected connected graph with 27 edged, 6 vertices of degree 2, 3 vertices of degree 4 and remaining of degree 3? 2

3. (a) Prove that $P(n)=1^3+2^3+3^3+\cdots\cdots+n^3=\{n(n+1)/2\}^2$ where $n>=1$ [solve by mathematical induction]. 4

   (b) Prove that 5^n-4n-1 is divisible by 16 for $n>=1$ solve by mathematical induction. 4

4. (a) Show that) ¬ p → (q → r and) q → (p ∨ r are logically equivalent. 4

   (b) Give an example of 2+2

   (i) A function which is injective but not surjective, and

   (ii) A function which surjective but not injective.

5. (a) What is power set? 2

   (b) What is generating function? 2

   (c) Prove that $3^n > n^2$ for a positive integer $n >= 1$ [solve by mathematical induction]. 4

6. (a) State two principles of mathematical induction. 2+2

   (b) Prove by one principle that every positive integer $n \geq 2$ is either a prime or can be written as a product of the primes. 4

7. (a) In a class containing 50 students 15 play tennis, 20 play hockey, 20 play cricket, 3 play tennis and cricket, 6 play cricket and hockey and 5 play tennis and hockey. 7 play no game at all. How many play cricket, tennis and hockey. 4

   (b) U ={1, 2, 3, 4, …….15} 4

   A = {2, 4, 6, 8, 10}

   C = {3, 7, 8, 11, 15}

   B = {1, 2, 6, 8, 12, 15}

   Find A∪B, A∩B, $A' \cup B'$, A⊕C

8. (a) Explain conjunction and disjunction with truth table. 2

   (b) Prove that complete graph K_4 is planar. 2

   (c) Prove that any connected graph G with n vertices and $(n-1)$ edges is a tree. 4

9. (a) Find the complete solution of the homogeneous recursive relation 4

   $a_n - 4a_{n-1} + 4a_{n-2} = 0$ For $n >= 2$ where $a_0 = 8$, $a_1 = 36$.

   (b) Prove the following equivalence $p \equiv (p \wedge q) \vee (p \wedge \sim q)$. 2

   (c) What is Hamiltonian path? 2

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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