WEST BENGAL STATE UNIVERSITY

B.Sc. Programme 5th Semester Examination, 2021-22

CMSGDSE02T-COMPUTER SCIENCE (DSE1)

DISCRETE STRUCTURES

Time Allotted: 2 Hours   Full Marks: 50

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.
All symbols are of usual significance.

GROUP-A

1.   Answer any *five* questions from the following: 2×5 = 10

(a) What is a relation?

(b) Prove that the proposition $p \wedge \sim p$ is a contradiction.

(c) What do you mean by a path of a graph? Explain with diagram.

(d) With an example, show the difference between function and relation.

(e) Give an example of bijective function.

(f) When a relation is said to be Partial ordering relation? Give an example.

(g) What are the basic needs of asymptotic notations?

(h) Define power set of a set.

(i) What is a recurrence relation?

GROUP-B

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

2. (a) Show that the maximum number of edges in a simple graph with *n* vertices is $\frac{n*(n-1)}{2}$. Define an Euler Graph. Prove that a given connected graph G is an Euler Graph if and only if all vertices of G are of even degree.   3+2+3

3.   State and prove the general Pigeonhole Principle. Give an example of regular graph which is not complete.   6+2

4.   Define with a suitable example a complete bipartite graph. What is Hamiltonian circuit? In a group of 6 Samurai, 7 Lords and 8 Ninjas, how many 10 member teams with 3 Samurai, 2 Lords and 5 Ninjas would be possible?   2+2+4

5. (a) Check whether $\neg (p \vee (\neg p \wedge q))$ and $\neg p \wedge \neg q$ are logically equivalent or not.   5+3
Consider functions $f(x)$, $g(x)$ and $h(x)$ such that $f(x) = O(g(x))$ and $g(x) = O(h(x))$. Show that $f(x) = O(h(x))$.

6 (a) Give an example of a relation that is reflexive and transitive but not symmetric.   4

(b) Prove by mathematical induction: $1^2 + 2^2 + 3^2 + ... + n^2 = \dfrac{n(n+1)(2n+1)}{6}$.   4

7. (a) In a group of 6 boys and 4 girls, four children are to be selected. In how many different ways can they be selected such that at least one boy should be there?   4

(b) Using truth tables, prove that: $p \vee q = \sim (\sim p \wedge \sim q)$ 4

8. (a) Define with proper figure: 6+2

    (i) O (Big-Oh) notation

    (ii) Ω (Big-Omega) notation

    (iii) Θ (Big-Theta) notation.

(b) Give O (Big-Oh) estimation for the factorial function $f(n) = n!$.

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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