TDC Even Semester Exam., 2019

COMPUTER SCIENCE

(Honours)

(2nd Semester)

Course No. : BCSH–202

(Discrete Mathematics)

Full Marks : 35
Pass Marks : 12

Time : 2 hours

*The figures in the margin indicate full marks
for the questions*

Answer **five** questions, taking **one** from each Unit

UNIT—I

1. *(a)* What is proposition? 2

(b) What are conjunction and disjunction? 2

(c) Verify that the proposition $p \rightarrow (p \vee q)$ is a tautology. 3

2. *(a)* Show that the propositions $\sim (p \vee q)$ and $\sim p \wedge \sim q$ are logically equivalent. 3

(b) Test the validity of the following argument : 4

If I study, then I will not fail in Maths.

If I do not play basketball, then I will study.

But I failed in Maths.

Therefore, I must have played basketball.

UNIT—II

3. *(a)* Show that the following are equivalent : 4

$$A \subseteq B, A \cap B = A$$

(b) Determine the power set of $A = \{a, b, c, d\}$. 3

4. *(a)* Explain with an example, the difference between function and relation. 3

(b) Let $X = \{1, 2, 3, 4\}$. Determine whether or not each relation below is a function from X into X : 2

  (i) $f = \{(2,3), (1,4), (2,1), (3,2), (4,4)\}$
  (ii) $h = \{(2,1), (3,4), (1,4), (2,1), (4,4)\}$

(c) Consider the following relation in A :

  $R = \{(1,1), (2,2), (2,3), (3,2), (4,2), (4,4)\}$

  (i) Is R reflexive? Give reasons.
  (ii) Is R symmetric? Give reasons. 2

(3)

UNIT—III

5. Consider the set N of positive integers and let $*$ denote the operation of least common multiple (LCM) on N.

   (a) Is $(N, *)$ a semigroup?   3

   (b) Find the identity element of $*$.   2

   (c) Which elements in N, if any, have inverses and what are they?   2

6. *(a)* Let $A = \{a, b\}$. Find a regular expression r such that $L(r)$ consists of all words w that contain an even number of a's.   2

   (b) Define context-free grammar and regular grammar.   5

UNIT—IV

7. *(a)* Explain with examples a partially ordered set and Hasse diagram.   3

   (b) Let D_m denote the positive divisors of m ordered by divisibility. Draw the Hasse diagrams of—

      (i) D_{12}

      (ii) D_{15} 4

8. *(a)* Explain what is meant by a lattice.   3

   (b) Prove that $(a * b) = a * b$.   4

(4)

UNIT—V

9. *(a)* Define graph, complete graph and degree of a vertex in a graph.   5

   (b) Define a cut point.   2

10. Prove that a finite connected graph G is Eulerian if and only if each vertex has even degree.   7

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