B.Sc. Semester-II Examination, 2022-23

COMPUTER SCIENCE [Honours]

Course ID : 21512 Course Code : SH/CSC/202/C-4

Course Title : Discrete Mathematics & Discrete Structures

[NEW & OLD SYLLABUS]

Time : 2 Hours Full Marks : 40

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

UNIT-I

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

a) Give an example for each of countably infinite set and uncountably infinite set.

b) "Every function is a relation but not conversely" –comment.

c) Name two methods used in integral approximation.

d) Express Fibonacci Series as a recurrence relation.

e) Why is recurrence tree needed?

f) What do you mean by planar graph?

[Turn Over]

g) Name an unary operator used in propositional logic and state its function.

h) What do you mean by WFF?

UNIT-II

2. Answer any **four** of the following questions: 5×4=20

a) Describe partially ordered relation with a suitable example.

b) Use mathematical induction technique to prove that:

$$1^2 + 2^2 + 3^2 + \cdots n^2 = \frac{n(n+1)(2n+1)}{6} \quad \forall\, n \geq 1$$

c) What is time complexity?

Show that $n^2 + 5n \neq O(n)$.

d) What do you mean by Hamiltonian circuit?

Describe graph isomorphism in terms of binary relation

e) Find a recurrence relation and initial condition for 1, 5, 17, 53, 161, 485, ...

f) Solve the recurrence relation $a_n = 3a_{n-1} + 2 \; where \; a_0 = 2, a_1 = 3$.

g) Show that $\rightarrow (a \vee b \vee c) = \rightarrow a \wedge \rightarrow b \wedge \rightarrow c$ where $\rightarrow$ stands for negation.

h) What is contingency?

Suppose that a, b and c denote the declarations "it is winter", "it is shiny" and "we organise badminton tournament" respectively. Then express the following two statements in terms of propositional logic: If it is shiny winter then we organise badminton tournament. Otherwise we do not organise badminton tournament.

UNIT-III

3. Answer any **one** of the following questions: 10×1=10

a) A general degree college offers various elective subjects for admission to BSc General degree as follows:

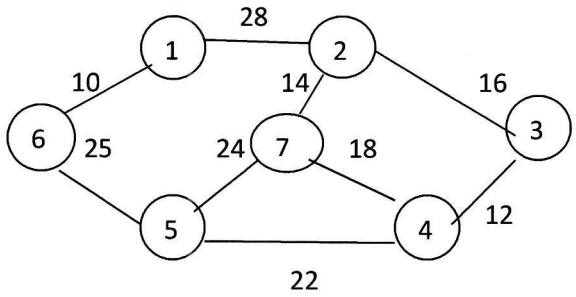
There are five subjects: Physics, Chemistry, Mathematics, Computer Sc and Electronics Any of these may be taken as the first subject. Two more subjects is to be chosen from the rest as the second and third subject. However, the relative order of second and third subject does not matter. The fourth subject should be the Environmental Studies.

Determine the number of (unique) subject combinations available. Write every subject combination offered by the college.

Also determine the number of subject combinations available if Computer Sc and Electronics are disallowed to be taken together. 10

b) Prove that a complete graph with five vertices is necessarily non planar.

Use Kruskal's algorithm to determine the minimum spanning tree of the graph shown below: 10



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