

U.G. 3rd Semester Examination - 2020**COMPUTER SCIENCE****[HONOURS]****Course Code : COMP.SC-H-CC-L-307**

Full Marks : 60

Time : 2½ Hours

*The figures in the right-hand margin indicate marks.**Candidates are required to give their answers in their own words as far as practicable.***GROUP-A**Answer any **ten** questions:

2×10=20

1. a) What do you mean by Hamiltonian path?
- b) What is regular graph?
- c) What is spanning trees?
- d) What do you mean by complete graph?
- e) What is conjunctive normal form?
- f) Write down the master theorem.
- g) What is pigeonhole principle?
- h) What do you mean by complement of a graph?
- i) What is chromatic number?
- j) What is the difference between tautology and contradiction?
- k) What do you mean by planar graph?
- l) Define Big-O notation.

*[Turn over]***GROUP-B**Answer any **four** of the following questions: 5×4=20

2. a) Solve the recurrence relation $a_n - 6a_{n-1} + 8a_{n-2} = 0$ 5
- b) Show that $(p \rightarrow q) \wedge (q \rightarrow p)$ is logically equivalent to $p \leftrightarrow q$. 5
- c) Let 'G' be a connected graph with six vertices and the degree of each vertex is three. Find the circuit rank of 'G'. 5
- d) Write down the rules of inference. 5
- e) Find the disjunctive normal form for the proposition $p \rightarrow q$. 5
- f) Use mathematical induction to prove that the sum of the first n natural numbers is $\frac{n(n+1)}{2}$. 5

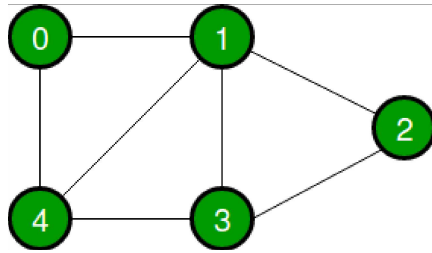
GROUP-CAnswer any **two** of the following questions: 10×2=20

3. a) i) Solve the recurrence relation $a_n - 8.a_{n-1} = 5.2^n$ where '.' represents multiplication operator.
- ii) Prove that $[(A \rightarrow B) \wedge A] \rightarrow B[(A \rightarrow B) \wedge A] \rightarrow B$ is a tautology. 5+5=10

b) i) Compute a truth table to verify that the proposition $(p \leftrightarrow q) \wedge (\neg p \wedge q)$ is a contradiction.

ii) Let 'G' be a connected planar graph with 20 vertices and the degree of each vertex is 3. Find the number of regions in the graph. $5+5=10$

c) i) Compute the adjacency matrix and adjacency list of the following graph:



ii) Solve the following recurrence relation using master's theorem:

$$T(n) = 2T(n/4) + n^{0.51} \quad 5+5=10$$

d) Write short notes on (any **two**): $5 \times 2 = 10$

- i) Graph isomorphism
 - ii) Asymptotic notations
 - iii) Graph coloring
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