Roll No.

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220201

May, 2019 MCA - 2nd Semester Data Structures (MCA-17-102)

Time : 3 Hours]

[Max. Marks: 75

Instructions:

1.

- 1. It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.
- 2. Answer any four questions from Part-B in detail.
- 3. Different sub-parts of a question are to be attempted adjacent to each other.

PART-A

- (a) Define Isomorphism using suitable example. (1.5)
 - (b) Is $[(p \cdot q) \rightarrow (p \cdot q)]$ a tautology? Use logical equivalence. (1.5)
 - (c) Explain in-degree and out-degree of each of the vertex in a graph using example. (1.5)
 - (d) Find the generating function for the finite sequence 1, 4, 16, 64, 256. (1.5)
 - (e) Determine whether the poset $(\{1, 2, 3, 4, 5\})$ and $(\{1, 2, 4, 8, 16\})$ are lattices. (1.5)

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- (f) Draw the Hasse diagram for the partial ordering $\{(A, B)\} \mid A \leq B\}$ on the power set P(S), where $S = \{a, b, c\}$. (1.5)
- (g) Write three rules of Hasse diagram? (1.5)
- (h) Is ~(p.(~p.q)) and ~p.~q logical equivalent?
 Use logical equivalence. (1.5)
- (i) Define Homomorphism using suitable example. (1.5)
- (j) Give two differences between Euler circuit and Hamiltonian graph. (1.5)



(5)

7.

PART-B

- 2. (a) Prove that the argument is valid without using truth tables :
 - (i) $(p \rightarrow q) \cdot (r \rightarrow s), (p \cdot r) \cdot (q \cdot r) \cdot q \cdot s.$
 - (ii) $P \cdot (p \rightarrow q), \ \sim p \cdot r \cdot \sim q$.
 - (iii) $p \to (q \cdot r), (s \cdot t) \to q, (q \cdot r) \to (s \cdot t) \cdot p \to q.$ (10)
 - (iv) $p \rightarrow q, q \rightarrow r, r \rightarrow s, \sim s, p \cdot t \cdot t.$ (10)
 - (b) Show that a Hamiltonian path is a spanning tree?

(a) Solve the following characteristic equation for two roots r1 and r2.

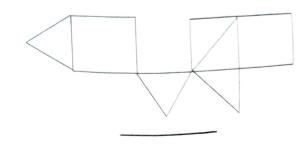
- (i) y'' + 3y' 10y = 0 y(0) = 4, y(0) = -2. (ii) 4y'' - 5y' = 0 y(-2) = 0, y(-2) = 7. (5)
- (b) List all the rules of inferences using suitable examples with tautology. (10)

- 4. Determine whether the following are tautology, contingency, and contradictions? Using truth table
 (a) α = (p→(q•r)) ((~q)→(p→r)).
 - (b) $(H \rightarrow (I \bullet J)) \rightarrow \sim (H \rightarrow I).$
 - (c) $q \cdot (p \cdot \neg q) \cdot (\neg p \cdot \neg q).$ (15)
 - (a) Which of these relations on {0, 1, 2, 3} are equivalence relations?
 - (i) {(0, 0), (1, 1), (2, 2), (3, 3)}
 - (ii) {(0, 0), (0, 1), (0, 2), (1, 0), (1, 1), (1, 2), (2, 0), (2, 2), (3, 3)}.

(5)

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- (b) Explain chromatic number of the graph c_n where $n \ge 3$? write each step. (10)
- 6. (a) Find the coefficients of x^5y^8 in $(x + y)^{13}$. (5)
 - (b) Give any two differences between Prim's and Kruskal's algorithm using a suitable example. (5)
 - Use depth first search to produce a spanning tree of a given graph. Write each step. (15)



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