BTS-III(S)-11.20-0668 Reg. No. | | | | | | | | | |

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B.Tech. Degree III Semester Supplementary Examination November 2020

CS/IT 15-1303 DISCRETE COMPUTATIONAL STRUCTURES

(*2015 Scheme*)

Time: 3 Hours Maximum Marks: 60

PART A

(Answer *ALL* questions)

(10 × 2 = 20)

I. (a) Show that $(A \cup (B \cap C))' = (C' \cup B') \cap A'$.

(b) Express the following statement in symbolic form. Also find the negation of the given statement.
"Some prime numbers are even".

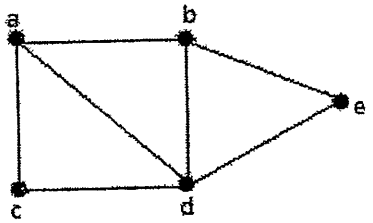
(c) "If two numbers a and b are even, then sum of a + b is even."
Give the inverse, converse and contra positive of the given statement.

(d) State and prove pigeon hole principle.

(e) Show that if 9 colors are used to paint 100 houses, at least 12 houses will be of the same color.

(f) State and prove handshaking lemma.

(g) Find the vertex connectivity and edge connectivity of the following graph. Also identify the cut vertex and cut edge of the given graph.



(h) Give the adjacency matrix representation of the graph given in in (g).

(i) Define semigroup with an example.

(j) Distinguish between bounded lattice and distributive lattice.

PART B

(4 × 10 = 40)

II. (a) Prove that $3 + 3 \cdot 5 + 3 \cdot 5^2 + \cdots + 3 \cdot 5^n = 3(5^{n+1} - 1)/4$ whenever n is a non negative integer using mathematical induction. (5)

(b) P : ~(p ∨ (~p ∧ q)) Q: ~p ∧ ~q .Show that P ≡ Q without using truth tables. (5)

OR

III. (a) Prove that $\sqrt{2}$ is irrational using proof by contradiction. (5)

(b) Prove that the relation R from set of positive integers to the set of positive integers which is defined by the rule $2a + 5b \equiv 0 \bmod 7$ where $a, b \in Z+$ is an equivalence relation. (5)

(P.T.O.)

IV. (a) Solve the following recurrence relation $a_n = 2a_{n-1} + 5a_{n-2} - 6a_{n-3}$ with initial conditions $a_0 = 7 a_1 = -4 a_2 = 8$. (5)

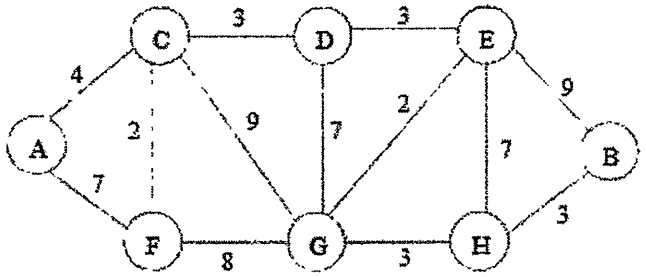
(b) Find the Big Oh estimate of $10 * 2^n + 3 n^2$. (5)

OR

V. (a) Explain the different asymptotic notations used for representing the complexity of an algorithm with examples. (6)

(b) There are 5-C programming books, 3-Calculus books and 2-Electronics books in a shelf. In how many ways we can select 2 books of different subject. (4)

VI. (a) Find the shortest path from A to B in the following graph using dijkstra's algorithm. Draw the shortest path and give it's weight. Draw the state updation table. (6)

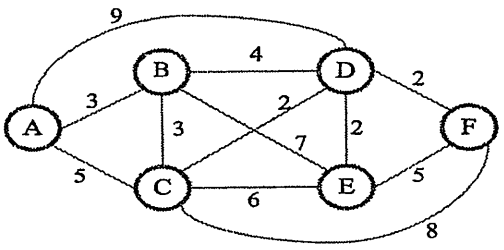


(b) State Euler's formula for planar graphs. Suppose that a simple planar graph has 20 vertices, each of degree 3 into how many regions does a representation of this planar graph split the plane? (4)

OR

VII. (a) Find the minimum spanning tree of the following graph using kruskal's algorithm. Draw the spanning tree and give it's weight. (5)

(5)



(b) Construct a unique binary tree from the Post-order and In-order traversal given
Post-order traversal: F E C H G D B K L I M J C A
and In-order traversal:E F C B D H G A K I L C M J

VIII. (a) Consider G/={1,5,7,11,13,17} under multiplication modulo 18 .Check whether the given system is a group under the given binary operation. (6)

(b) Show that if $(ab)^2 = a^2 b^2$ for all a,b $\in$ G, then G is abelian. (4)

OR

IX. Draw the Hasse diagram representing the partial ordering (10)
{(a, b) |a divides b} on {1, 2, 3, 4, 6, 8, 12}.

(i) List out the maximal elements and minimal elements in the POSET.

(ii) Find the LUB and GLB of the set {2,4,6}

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