BTS-III(S)-(11.20/04.21)-1693 Reg. No. | | | | | | | | |

B

B.Tech. Degree III Semester Supplementary Examination
November 2020/April 2021

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) Define tautology and contradiction. Check whether pv~p and p^~p satisfy any of the definitions in this question.

(b) Prove that $p \leftrightarrow q \equiv (p \wedge q) \vee (\neg p \wedge \neg q)$

(c) How many of the numbers will have the same remainder when divided by 5 if any six positive integers are chosen?

(d) Solve $a_r - 6a_{r-1} + 9a_{r-2} = 0$ with $a_0 = 1$ and $a_1 = 6$.

(e) Give an example of a graph that has an Euler circuit which is not Hamiltonian.

(f) Draw complete binary tree with 15 nodes. What is the depth of complete binary tree if 'n' nodes are there in the tree?

(g) Define abelian group. Show that an algebraic system (G, *) where G is the set of all non-zero reals and * is a binary operation defined by a*b=(ab)/2 is abelian.

(h) Define Bounded lattice and complemented lattices.

(i) Determine whether the relation S = {(a, b): a divides b} on set R of real numbers is a partial order relation.

(j) Consider the functions f, g, h on integers defined by $f(n) = n - 1$, $g(n) = n^2$, $h(n) = n + 1$. Find hofog and fogoh.

PART B

(4 × 10 = 40)

II. Prove by induction

(a) Prove using mathematical induction that for all (5)

$$n \geq 1,\ 1 + 4 + 7 + \cdots + (3n - 2) = n(3n - 1)/2$$

(b) Sum of cubes of three consecutive integers is divisible by 9. (5)

OR

III. (a) Among the first 500 positive integers how many are not divisible by 2 nor 3 nor 5 nor by 7. Also determine the number of integers that are not exactly divisible by any of them. (5)

(b) If R and S are equivalence relation prove $R \cap S$ and RUS are equivalence relation. (5)

(P.T.O)

IV. (a) Solve $F_r - F_{r-1} - F_{r-2} = 0$ with initial condition $a_0 = 1$ and $a_1 = 1$. (5)

(b) If 9 colors are used to paint 100 houses how many houses will have the same color. (5)

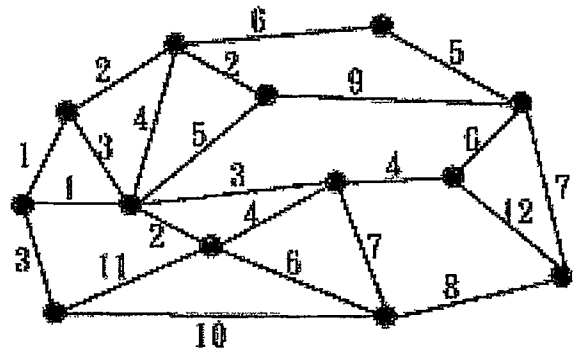
OR

V. (a) What are the characteristics of algorithm? (5)

(b) Define Best case time, worst case time, average case time, θ notation, O notation. (5)

VI. (a) Given the inorder and preorder of binary tree (5)
Inorder : 3 * a + b * b * c + d
Preorder: * * * 3 a b + * b c d. Draw the tree.

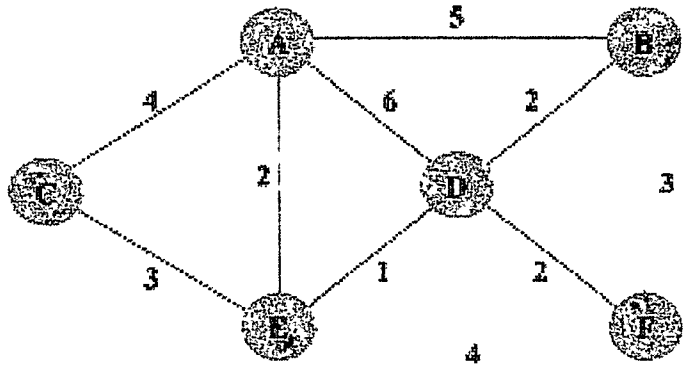
(b) Find the minimum spanning tree by Kruskal's algorithm. (5)



OR

VII. (a) Give example for a graph which is both Euler circuit and Hamiltonian circuit. (5)

(b) Find the shortest path from vertex C to other vertices using Dijikstra's algorithm. (5)



VIII. (a) Define Poset and Lattice. (5)

(b) Determine all sub lattices of D_{30} that contain at least four elements. (5)

OR

IX. (a) Define field and Ring. (5)

(b) Let S is {0, 1, 2, 3, 4} and addition modulo 5 and multiplication modulo 5. Check whether (S, +, *) form a field. (5)

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