Sr. No. 018402

August/September 2022

B.Tech(CSE(AIML)/CE/CE(DS)/CSE/IT) 4th Sem.

Discrete Mathematics (PCC-CS-401)

Time: 3 Hours **Max. Marks:75**

Instructions:
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

Q1 (a) State and Prove Demorgan's LAW (1.5)

(b) Define CNF. (1.5)

(c) In the different permutations of the word 'EXAMINATION' are listed as in a dictionary , How many items are there in the list before the first word starting with E? (1.5)

(d) Show that $1^2 + 2^2+3^2+.....+n^2 = n(n+1)(2n+1)/6$ (1.5)

(e) Prove using contraposition: If 3n+7 is an odd integer, then n is an even integer. (1.5)

(f) Define Euler Formula? (1.5)

(g) What is a cut point and bridge in graphs? (1.5)

(h) Show that the number of vertices having odd degree is always even in a graph. (1.5)

(i) What are bijective functions? (1.5)

(j) Translate these statements into English. where C(x) is "x is a comedian" and F(x) is "x is funny" and the domain consists of all people. (1.5)

a) $\forall x\ (C(x) \rightarrow F(x))$
b) $\exists x\ (C(x) \wedge F(x))$

Negate the above statements and express in predicate logic as well as English.

PART -B

Q2 (a) Let f be a function from the set of integers such that $f(x)=x^3-7$. Is f invertible, and if it is what is its inverse? (5)

(b) There are 350 farmers in a large region. 260 farm beetroot, 100 farm yams, 70 farm radish, 40 farm beetroot and radish, 40 farm yams and radish, and 30 farm beetroot anand yams. Let B, Y, and R denote the set of farms that farmbeetroot, yams and radish respectively. Determine the number of farmers that farm atleast one of the crop. (5)

(c) Define Cantor's Diagonal Argument. (5)

Q3 (a) Show that following implication is tautology: (10)

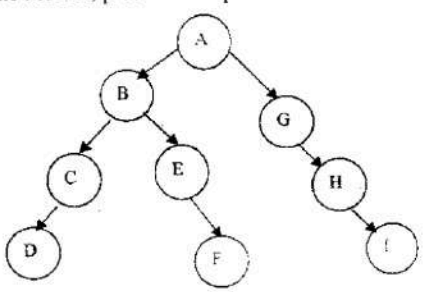
a. (p=>q)v r=>[(pvr)=>(qvr)]

b. . (pAq=>r) v (p=>r)v(q=>r)

(b) Find the validity of the following Argument: (5)

If my friend does not come to meet me, then I will go to office.
If I go to office, then I will complete my work.
Using rules of inference, Can we conclude, "If I am not happy, then I will complete my work"?

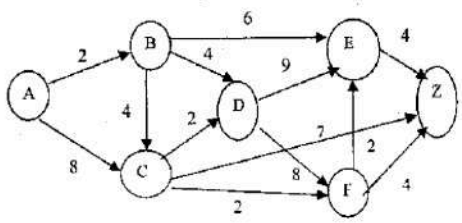
Q4 (a) Determine the Inorder, preorder and postorderTraversal of following tree: (6)



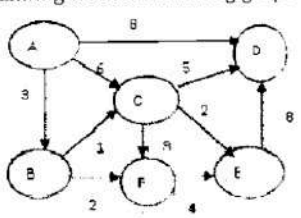
(9)

(b) Write short notes on following:
- i) Equivalence Relations.
- ii) Articulation Point.
- iii) Cosets.

Q5 (a) Find the shortest distance between A and Z: (10)



(b) Draw the Minimum Spanning tree for following graph: (5)



Q6 (a) Explain and prove Schroeder Bernstein theorem. (10)

(b) What is a Perfect Graph? Explain with example (5)

Q7 a) What is Field? Explain with example. (5)

b) Consider an algebraic system (Q,*) where Q is a set of rational numbers and * is binary operation defined by: (10)

$$a*b=2a+2b-ab$$

Determine whether (Q,*) is a group.

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