Code No: 123BN **R15**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, August/September -2022
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE
(Common to CSE, IT)

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

Answer any five questions
All questions carry equal marks
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1.a) Show that ($p \rightarrow r) \wedge (q \rightarrow r) and\ (p \vee q) \rightarrow r$ are logically equivalent.
b) Show that $(\exists x)(P(x) \wedge Q(x)) \Longrightarrow (\exists x)P(x) \wedge (\exists x)Q(x)$. Is the converse true? [7+8]

2. Obtain the PDNF and PCNF of the following formula.
P $\vee$ (~P$\rightarrow$ (Q $\vee$ (~Q$\rightarrow$R))) [15]

3.a) Define the dual of a statement in a lattice L. Why does the principle apply to L?
b) A function f:(Z x Z) $\rightarrow$ Z is defined as f(x,y) = 4x+5y. Prove that f is onto, but not one-to-one. [7+8]

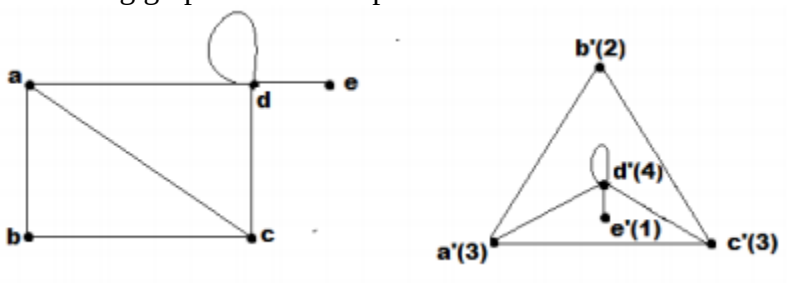
4.a) Given S = {1,2,3,....,10}and a relation R on S where R = {<x, y> / x+y +10}, what are the properties of the relation R? Explain.
b) Define Semi-groups and Monoids. Give examples and properties of each. [8+7]

5.a) State and prove multinomial theorem. Determine the coefficient of $x^3y^3z^2$ in the expansion of $(2x - 3y + 5z)^8$.
b) How many ways are there to seat 10 boys and 10 girls around a circular table, if boys and girls seat alternatively. [8+7]

6.a) There are 35 students and 04 teachers. In how many ways every student shakes hand with other students and all the teachers?
b) Prove that in a group of six people at least three must be mutual friends or at least three must be mutual strangers. [8+7]

7.a) Solve the following recurrence relations.
a_n-5a_{n-1}+ 8a_{n-2}-4a_{n-3}= n2^n
b) Solve the recurrence relation by using substitution method
a_n=a_{n-1}+1/n(n+1), a_0=1 [7+8]

8.a) Show that the complete graph K5 and complete bipartite graph $K_{3,3}$ are not planar?
b) Show that the following graphs are isomorphic. [8+7]



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