Code No: 154AQ **R18**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year II Semester Examinations, August/September - 2022
DISCRETE MATHEMATICS
(Common to CSE, IT, ITE, CSE(SE), CSE(CS), CSE(N))

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

Answer any five questions
All questions carry equal marks
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1.a) Construct the truth table of the compound proposition $(p \vee \neg q) \rightarrow (p \wedge q)$.

b) Show that $p \vee (q \wedge r)$ *and* $(p \vee q) \wedge (p \vee r)$ are logically equivalent. [7+8]

2.a) Show that $\neg \forall x (P(x) \rightarrow Q(x))$ *and* $\exists x (P(x) \wedge \neg Q(x))$ are logically equivalent.

b) Consider these statements "All lions are fierce", "Some lions do not drink coffee", "Some fierce creatures do not drink coffee"
Let P(x),Q(x), and R(x) be the statements "x is a lion", "x is fierce" and "x drinks coffee" respectively. Assuming that the domain consists of all creatures express the statement in the argument using quantifiers and P(x),Q(x) and R(x). [8+7]

3.a) Define Fibonacci sequence . Find the Fibonacci numbers $f_2, f_3, f_4, f_5,$ *and* f_6.

b) If $A = \begin{bmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 1 & 1 & 0 \end{bmatrix}$ then, find $A^{[n]}$ for all positive integers 'n'. [8+7]

4.a) Define Equivalence relation.Show that the "divides" relation is the set of positive integers is not an equivalence relation.

b) Draw the Hasse diagram representing the partial ordering.
$\{(a,b) / a \text{ divides } b\}$ *on* $\{1,2,3,4,6,8,12\}$. [7+8]

5.a) Give a $big-O$ estimate for $f(x) = (x+1)\log(x^2+1) + 3x^2$.

b) Show that $7x^2$ *is* $O(x^3)$. [8+7]

6.a) Use mathematical induction to show that $1+2+2^2+2^3+.....+2^n = 2^{n-1}$.

b) Give a recursive definition of a^n, where 'a' is a nonzero real number and 'n' is a non negative integer. [8+7]

7. Solve the recurrence relation $a_n = 6a_{n-1} - 9a_{n-2}$ with initial conditions $a_0 = 1$ *and* $a_1 = 6$? [15]

8.a) What are the applications of Trees?

b) Explain various tree traversal techniques with examples for each. [5+10]

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