SPECIAL SUPPLIMENTARY END SEMESTER EXAMINATION-2019

………… Semester B.Tech & B.Tech Dual Degree

DISCRETE MATHEMATICAL STRUCTURES

MA 2003

(-……..Admitted Batch & Back)

Time: 3 Hours　　　　　　　　　　Full Marks:50/ 60

Answer any SIX questions including question No.1 which is compulsory.

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable and all parts of a question should be answered at one place only.

1.			[1 X 10] /[2 X 10]
	(a)	Find the negation of the statement:“If n is divisible by 30 then n is divisible by 2 and by 3 and by 5.”	
	(b)	Using truth table prove that $\sim(p \vee q) \equiv \sim p \wedge \sim q$.	
	(c)	What is the universal quantification of the sentence: $x^2 + x$ is even integer where x is an odd integer? Is the universal quantification is a true statement?	
	(d)	Let D_{20} denote the set of all positive divisor of 20. Draw the Hasse diagram of the divisibility relation of the POSET D_{20}	
	(e)	Find the number of positive integers not exceeding 100 that are either odd or square of an integer.	
	(f)	Find generating functions corresponding to the numeric function $a_n = 2^{n+1} - 1; n \geq 0$	

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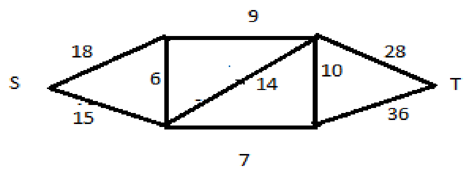
	(g)	Find the values of the Boolean function represented by $F(x, y, z) = x\overline{y} + z$.	
	(h)	Give example of a zero-divisors in a ring.	
	(i)	Define the following terms: (i) Spanning tree. (ii) Bipartite graph	
	(j)	Define Regular graph. If a complete graph has degree 8 for each vertex, then how many edges are there?	
2.			$[2 \times 4]$
	(a)	Show that $(p \wedge q) \rightarrow (p \vee q)$ is a tautology	
	(b)	Show that the argument form with premises $(p \wedge t) \rightarrow (r \vee s)$, $q \rightarrow (u \wedge t)$, $u \rightarrow p$, and $\sim s$ and conclusion $q \rightarrow r$ is valid.	
3.			$[2 \times 4]$
	(a)	Prove $2^n > n^3$ for $n \geq 10$ by method of induction.	
	(b)	If $a_n = 5a_{n-1} - 6a_{n-2}$; $a_0 = 2$; $a_1 = 5$ then using strong induction show that $a_n = 2^n + 3^n$.	
4.			$[2 \times 4]$
	(a)	Let $R = \{(a_1, a_1), (a_1, a_2), (a_1, a_4), (a_2, a_3), (a_3, a_3), (a_3, a_5), (a_4, a_4), (a_5, a_2)\}$ be a relation on the set $A = \{a_1, a_2\, a_3, a_4, a_5\}$ Find the transitive closure of R using Warshall's algorithm.	
	(b)	Let R be a reflexive relation on a set A such that $(a, b)\in R,\ (a, c)\in R \Longrightarrow (b, c)\in R$. Show that R is an equivalence relation.	
5.			$[2 \times 4]$
	(a)	Find the numeric solution of the recurrence relation $a_n - a_{n-1} = n;\quad n \geq 1$ with $a_0 = 0$ using generating function.	
	(b)	Solve the following recurrence relation $a_r - 4a_{r-1} = 8^r$; for $r \geq 1$ with the initial condition $a_0 = 1$ by substitution method.	
6.			$[2 \times 4]$
	(a)	Find the sum-of-products expansion for the Boolean function $F(x, y, z) = (\overline{x} + y)z$.	
	(b)	For any Boolean algebra B, prove that $(a + b)(b + c)(c + a) = ab + bc + ca$.	
7.			$[2 \times 4]$
	(a)	Let G be a group and $a, b, c \in G$. Then show that (i) $ab = ac \Longrightarrow b = c$, (ii) $(ab)^{-1} = b^{-1}a^{-1}$.	
	(b)	Determine whether the set of positive integers Z^+ with the binary operation * defined by $a * b = gdc(a, b)$ is a semigroup, monoid or nither. If it is monoid specify the identity	
8.			$[2 \times 4]$
	(a)	Define degree of a vertex , bipartite graph and adjacency matrix with examples.	
	(b)	Using Dijkstra's algorithm find the shortest path from vertex a to z from the following weighted graph. 	
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