AUTUMN END SEMESTER EXAMINATION-2018

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

DISCRETE MATHEMATICAL STRUCTURES

MA 302

(-……..Admitted Batch & Back)

Time: 3 Hours Full Marks: 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.			[2 × 10]
	(a)	Find the negation of the statement: $2 + 4 = 6 \Rightarrow 5 + 2 = 7.$	
	(b)	Using truth table prove that $\sim(p \vee q) \equiv \sim p \wedge \sim q$.	
	(c)	Determine the truth value of each of the following statements if the domain consists of all integers. (i) $\forall n(n + 1 > n)$ (ii) $\exists n(2n = 3n)$	
	(d)	Find the equivalence relation corresponding to the partition set $P = \{ \{a,b\}, \{c\}, \{d,e\}\}$ of the set $A = \{a, b, c, d, e\}$.	
	(e)	Find the number of positive integers not exceeding 100 that are divisible by either 4 or 9.	
	(f)	Find generating functions corresponding to the numeric function $a_n = n^2;\ n \geq 1.$	
	(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.	

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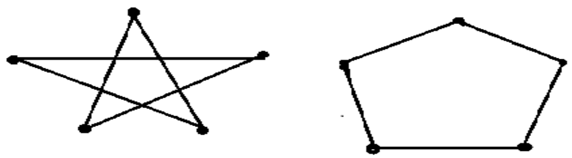
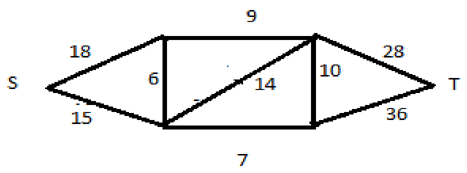
	(i)	Define the following terms: (i) Spanning tree. (ii) Bipartite graph	
	(j)	Find the greatest lower bound and least upper bound of the subset $\{8, 10, 12\}$, in the poset ( ).	
2.			$[2 \times 4]$
	(a)	Show that $(p \wedge q) \rightarrow (p \vee q)$ is a tautology	
	(b)	Show that the argument form 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)	Use mathematical induction to prove that $n^3 - n$ is divisible by 3 whenever *n* is a positive integer.	
	(b)	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.	
4.			$[2 \times 4]$
	(a)	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.	
	(b)	Let $S = \{a, b, c\}$. Show that $(P(S), \supseteq)$ is a complemeted lattice? Draw its Hasse diagram.	
5.			$[2 \times 4]$
	(a)	Find the numeric solution of the recurrence relation $a_n - a_{n-1} = n$; $n \geq 1$ with $a_0 = 0$ using generating function.	

	(b)	Find the numeric solution the recurrence relation $a_r - 4a_{r-1} = 8^r$; for $r \geq 1$, with $a_0 = 1$.	
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)	Let G be the set of all nonzero real numbers and $a * b = \frac{ab}{2}$. Show that $(G, *)$ is an abelean group.	
8.			$[2 \times 4]$
	(a)	Are these following graphs Isomorphic? Justify your answer.  Fig.1 Fig.2	
	(b)	Using Dijkstra's algorithm find the shortest path from vertex a to z from the following weighted graph.	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