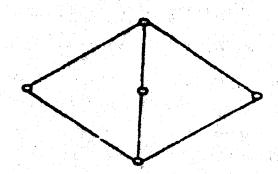
Nar	ne : .		• • • • • • • • • • • • • • • • • • • •	••••••	,	••••••		
Roll	No.	• • • • • • • • • • • • • • • • • • • •				· · · · · · · · · · · · · · · · · · ·	••••	
Invi	gilato	or's S	ignature :		• • • • •		•••••	
			CS/N	igures in the margin indicate full marks. required to give their answers in their own words as far as practicable. GROUP - A Iultiple Choice Type Questions) correct alternatives for any ten of the following: $10 \times 1 = 10$ tion R is called an equivalence relation if is reflexive and transitive is reflexive and symmetric is reflexive, transitive and symmetric is reflexive, anti-symmetric and transitive. Ind B are nonempty sets. Then cardinality of A and B are spectively then cardinality of $A \times B$ is b) 5				
•								
	DIS	SCR	ETE MATH	EMATI	CAI	STRU	CTURE	S
Tim	e Allo	otted	: 3 Hours				Full Mark	s : 70
		Tł	ne figures in the	e margin i	ndica	ite full mo	arks.	
Ca	ındid	ates	are required to	give their	ansı	wers in th	ieir own w	ords
			as	far as pr	actico	able.		
				GROUP -	A			
			(Multiple Cl	noice Ty	pe G	uestion	s)	
1.	Cho	ose	the correct alte	ernatives	for ar	ny ten of t		0
	i)	A r	elation R is cal	led an eq	uival	ence relat	ion if	
	* ,	a)	R is reflexive	and tran	sitive			
•		b)	R is reflexive	and sym	metri	ic	e de la companya de La companya de la co	
		c)	R is reflexive	, transitiv	e and	d symmet	ric	
		d)	R is reflexive	, anti-syn	ımetı	ric and tr	ansitive.	
	ii)						•	
		a)	6		b)	5		
	,	c)	13		d)	4.		
	iii)	The	coefficient of	$x^3y^2z^2$ in	(x+y)	$(y+z)^9$ is		
		a) ⁻	(9!)/(7!)		b) .	(9!)/(3)	2! 2!)	
		c)	(7!)/(7!)		d)	(3! 2! 2!		

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iv)	The membership fu	nction of a fu	zzy set is defined in
	a) {0,1}	b)	(0, 1)
	c) [0,1]	d)	none of these.
v)	The maximum nun	ber of vertice	es in a connected graph
	having 17 edges is		
	a) 18	b)	17
	c) 19	d)	12.
vi)	Let L be a language	given by $L =$	$\{a^nb^n: n \ge 0\}$ then L^2 is
	equal to		
	a) $\left\{a^nb^na^mb^m:n\right\}$	≥0, m≥0}	
	b) $\{a^nb^n:n\geq 0\}$		
	c) $\{a^nb^na^mb^m:n$	≥ 0}	
	d) none of these.		
vii)	In Prime's Algorith	n, the weight	t of non-existing edge is
	take as		
	a) 0	b)	1
	c) + infinity	d)	none of these.
viii)	There are 4 blue, 3	red and 2 bla	ick pens in a box. These
	are drawn one by permutations.	one. Deter	mine all the different
	a) 1080	b)	1060
	c) 1100	d)	None of these.
ix)	Every self compleme	entary graph	has vertices
	a) $4k + 1$	b)	4k
	c) $4k+1$ or $4k$	d)	none of these.

- The proposition $P \wedge (-p \vee q)$ is X)
 - a tautology a)
 - logically equivalent to $p \wedge q$ b)
 - c) logically equivalent to $p \vee q$
 - a contradiction.
- Which of the following is/are tautology?
 - a) $a \lor b \rightarrow b \land c$
- b) $a \wedge b \rightarrow b \vee c$
- c)
 - $a \lor b \to (b \to c)$ d) $a \to b \to (b \to c)$.
- xii) The following is the Hass diagram of the poset $|\{a, b, c, d, e\}|$. The poset is



- a) not a lattice
- b) a lattice but not a distributive lattice
- c) a distributive lattices but not a Boolean algebra
- a Boolean algebra. d)

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GROUP - B

(Short Answer Type Questions)

Answer any three of the following. 3 x

- $3 \times 5 = 15$
- 2. Prove that for a simple graph having n vertices and k components, the maximum number of edges is $\frac{(n-k)(n-k+1)}{2}$.
- 3. Prove that in a bounded distributive lattice, complement of an element is unique.
- 4. Obtain a conjunctive normal form of $p^{(p = q)}$.
- 5. Design a finite state machine that performs serial addition.
- 6. Draw the transition diagram for the FSA with $I = \{a, b\}$,

$$Q = \{q_0, q_1, q_2\}, F = \{q_0, q_1\} \text{ and } \delta \text{ is given by}$$

δ	а	b
q_{0}	$oldsymbol{q}_0$	q_1
$oldsymbol{q_1}$	q_0	q_2
$q^{}_2$	q_2	q_2

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GROUP - C

(Long Answer Type Questions)

Answer any three of the following.

 $3 \times 15 = 45$

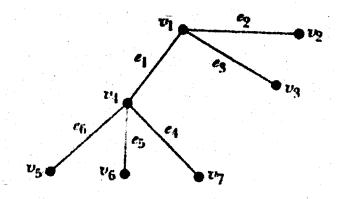
7. a) In a set A, a relation R is defined as follows

$$R = \{(a_1, a_1), (a_1, a_2), (a_1, a_4), (a_2, a_3), (a_3, a_3),$$

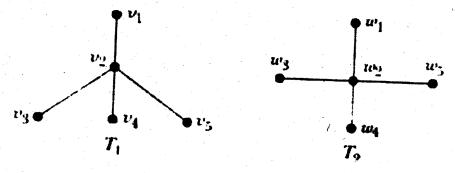
$$(a_3, a_5)(a_4, a_4)(a_5, a_2)$$

Determine the transitive closure of R using Warshall's algorithm.

b) Determine the adjacency matrix for the following graph.



c) Examine whether the following trees are isomorphic



9 + 3 + 3

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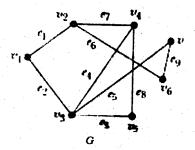
8. a) Evaluate the following postfix expression

 $24 \ 4 + 3 \cdot 7/26 \ 4 - +$

b) Draw the tree for the following infix expression and find the corresponding prefix expression

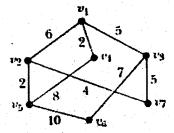
$$((A + B)/(C - D) + E). F - G.$$

c) Draw a spanning tree of the following graph:

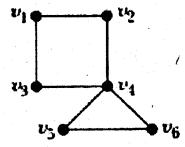


4 + 8 + 3

9. a) Apply Prim's algorithm to find a minimum spanning tree from the following weighted graph.



b) Apply BFS algorithm to find a spanning tree of the following graph



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c) Draw the transition diagram from the DFA given by

$$M = (\{q_0, q_1, q_2\}, \{0, 1\}, q_0, \delta, \{q_2\})$$

$$\delta(q_0, 0) = q_1,$$

$$\delta(q_1, 1) = q_2,$$

$$\delta(q_0, 1) = q_0,$$

$$\delta(q_2, 0) = q_0,$$

$$\delta(\boldsymbol{q}_1, 0) = \boldsymbol{q}_2,$$

$$\delta(q_2, 1) = q_1,$$

$$5 + 5 + 5$$

- 10. a) What is Language and what is Grammar? Why Language & Grammar is needed for computer science?
 - b) Construct the grammar for the language $L = a^n b^n c^m d^m$, m, n, > 0.
 - c) Construct a Moore machine equivalent to the Mealy machine M given by the following table:

Dangers	Next State				
Present state	a = 0		a = 1		
	state	output	state	output	
->q1	q1	1	q2	0	
q2	q4	1	q4	1	
<i>q</i> 3	q2	1	q 3	1	
q4	<i>q</i> 3	0	<i>q</i> 1	1	

d) Construct a Mealy machine which is equivalent to the Moore machine given by the following table:

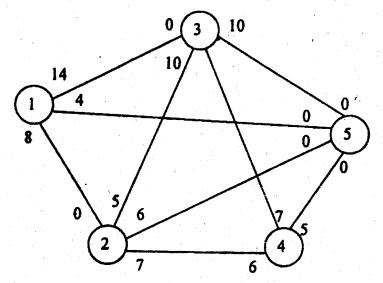
Present state	Ne		
- 1000III State	a = 0	a = 1	Output
-> q0	q1	q_{2}	1
q1	<i>q</i> 3	- q2	0
q2	· q2	<i>q</i> 1	1
<i>q</i> 3	q0	<i>q</i> 3	1

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MeA (18).

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11. a) Determine the maximal for in the following network:



- b) Show that $f: R \to (-1, 1)$ given by $f(x) = \frac{x}{1+|x|}$ is injective.
- c) Prove that in a simple graph with n vertices and m components can have at most $\frac{(n-m)(n-m+1)}{2}$ edges. 7+2+6