1953

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Roll No:

(To be filled in by the candidate)

PSG COLLEGE OF TECHNOLOGY, COIMBATORE - 641 004 SEMESTER EXAMINATIONS, APRIL 2019 (PHASE I)

MCA Semester: 1

	اع م	18M	IX12	MAT	HEMA'	TICAL	FOUN	DATIO	NS OF	COM	PUTE	R SCII	ENCE	0
Time: 3 Hours Maximum M												arks : 1	00	
INSTRUCTIONS:														
1.	-	W ~ 30		-		_	estion ca					~G		
2.								subdivi	ision (b) car	ries 7	marks	each a	nd
<u> </u>	sut	odiv	1S10n	(c) car	ries 15 ı	marks ea	ach	CY			H		-ck	
1.	a)	Pro	ove th	ne follo	wing Dis	stributiv	e laws w	ithout u	ising Ve	enn dia	gram.	C.	TEO	
4	OC	A	. ∩ (B	U C)	= (A ∩ E	3) U (A	n c).		00	G		050	•	
1		A	V (E	} ∩ C) :	= (A U E	3) ∩ (A	U C) .		Y					Y
	b)	i)	Prov	e that	a function	on f:R→	R define	ed by f(x	()=7x–1	is a b	ijective	functio	n. CY	[4]
		ii)	Is 3 ^r	' – 1 is	multiple	of 2? C	Check yo	ur ansv	ver usir	ng Math	nematio	cal Indu	ction.	[3]
<	c)	i)											D playe	-00
\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \													/. 25 ow	
													vned a V nolds had	
		G	-		f the thr	-	- G			6			TE	[5]
*	65	ii)	Find	(g•f•h)	(t) for g	, f, and	h as q(t)	$=\sqrt{x}$; f($(t) = x^2;$	h(t) = 5	5 x ⁹	25°		[5]
A	•	iii)	Prov	e the f	ollowing	result	using M	$1: 1^3 + 2$	2 ³ + 3 ³ +	⊦+r	$1^3 = \frac{1}{4}$	[n²(n + ˈ	1) ²]	[5]
2.	a)						a), (a, b (iii) trar			on the	set A	= {a, b,	c}. Find	d: (i)
	b)	i)	If R	and S	are equi	ivalence	relation	ns. Prov	e that F	R ∩S is	also E	quivale	nce.	[3]
A		ii)	Prov	e that	(P □ Q)	∨ (Q 🗓	P) is a	Tautolog	gy.			G'\		[4]
	c)	l) .		Prove to on a se		S•T) = (F	R•S) •T.	Where	R, S, a	and Ta	are thre	ee relat	ions defi	ned [5]
	6.	9	ii) (Conside	er the re	elation F	$R = \{(1, 3)\}$	3), (1, 4)	, (3, 2),	(3, 3),	(3, 4)}	on A =	{1,2,3,4	}
1				(a) Fir	nd the m	natrix M	R of R.		(d) Dr	aw the	direct	ed grap	h of R.	
			18	(b) Fir	nd the d	omain a	and rang	e of R	(e) Fi	nd the	compo	sition r	elation R	·R.
		-G		(c) Fir	ıd R⁻¹.		. (-14	(f) Fi	nd R•R	⁻¹ and	R⁻¹•R.	CH	[5]
	P	2	iii) -	Γest the	e validity	y of the	followin	g argum	ent:	TE		<	EO	[5]
A				If I stu	dy, ther	n I w <u>ill</u> n	ot fail m	athema [.]	tics.			CG		
			16	-	•		tball, the					33		
		G			ailed ma	A		CH			CH	25 ^G	CC	, ,
	Y.			-G	7		-G ¹			1			GTEC	

Therefore I must have played basketball.

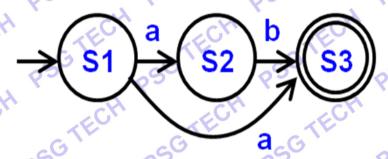
(OR)

II) i) Prove the following distributive laws using tautology approach. [5+5

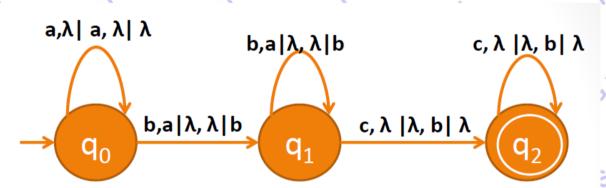
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 $P \wedge (Q \vee R) = (P \wedge Q) \vee (P \wedge R)$ and $P \vee (Q \wedge R) = (P \vee Q) \wedge (P \vee R)$

- ii) Consider the **Z** of integers and an integer m > 1 and x is congruent to y modulo m is written as $x \equiv y \pmod{m}$, if (x y) is divisible by m. Show that this defines an Equivalence relation on **Z**. [5]
- 3. a) Differentiate the different types of grammar with the help of their production rules.
 - b) i) Draw the machine diagram alone to show the Push Down Automata derived from the Context Free Grammar (CFG) $G: S \to aTXb$, $T \to XTS \mid \epsilon$ and $X \to a \mid b$ [3]
 - ii) Convert the given NFA machine M₁ into a DFA machine M₂. [4]

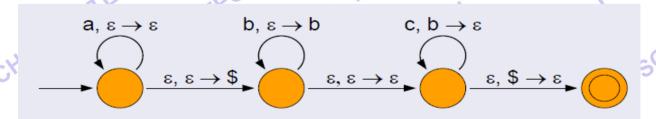


- c) I) i) Prove that the following Grammar generates all even integers up to 998. [8] Let G = (V, T, P, S), where $V = \{S, S_1, A, B\}$, $T = \{0,1,2,3,...,9\}$ and $P : S \rightarrow 0|2|4|6|8$, $S\rightarrow AS_1$, $A\rightarrow 1|2|3|4|5|6|7|8|9$, $S_1\rightarrow 0|2|4|6|8$, $S\rightarrow ABS_1$, $B\rightarrow 0|1|2|3|4|5|6|7|8|9$
 - ii) Prove that the following PDA machine with 2 stack accepts L={aⁿbⁿ | n≥0} [7]



(OR)

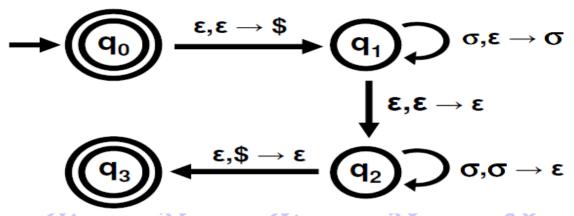
II) i) Identify the Language accepted by the machine given below. Justify your answer with suitable example. [8]



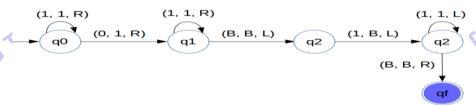
ii) Identify the Language identified by the Machine given below.

[7]

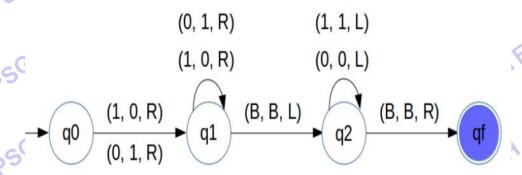
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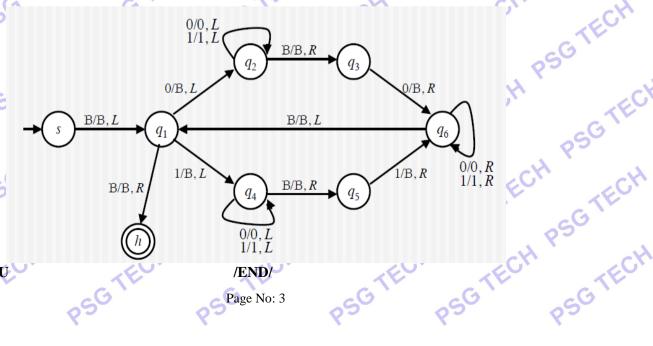
4. a) Write the Transition (δ) table for the machine given below.



PSGTECH b) Prove that the Language accepted by the machine given below is 1's complement of a given number. Justify your answer with appropriate example.



c) Define the Turing Machine M shown below. Also, identify the Language L recognized [15] by the machine M.



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