B.E.(with Credits)-Regular-Semester 2012 - Information Technology Sem. IV IT404 - Theory Of Computation

P. Pages : 3

1.

Time : Three Hours

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Max. Marks: 80

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Notes :	1.	Same answer book must be used for all questions.
	2.	All questions carry marks as indicated.
	3.	Due credit will be given to neatness and adequate dimensions.
	4.	Assume suitable data wherever necessary.
	5.	Illustrate your answers wherever necessary with the help of neat sketches.
	6.	Use of slide rule, Logarithmic tables, steam tables, Mollier's chart, Drawing
		instruments, Thermodynamic tables for moist air, Psychrometric charts and
		Refrigeration charts is permitted.
	7.	I.S.I. Hand Book for structural steel section. I.S. Code 8000/1962 or 1964, I.S.
		456 (Revised), I.S. 875 may be consulted.
	8.	Use of D.A. Law's "Pocket book for Mechanical Engineers" is permitted.
	9.	Discuss the reaction, mechanism wherever necessary.
a) G	ive d	eterministic finite automata accepting the following languages over the alpha sets
((), 1)	
a)) T	he set of all strings such that "10" as substring.
b) T	he set of all strings such that the string does not contain "1011" as substring.

b) Convert the following NFA with \in - transitions into equivalent NFA without \in - transitions.



OR

2. a) Construct DFA equivalent to the NFA ($\{p,q,r,s\}, \{0,1\}, \delta, p, \{q,s\}$) where δ is given **8** below:-

δ	0	1
р	q,s	q
q	r	q,r
r	s	р
S	-	р

b) Convert the following Moore m/c into equivalent Mealy m/c:-

	0	1	λ
$\rightarrow q_0$	q_0	q ₁	1
q_1	q_0	q ₂	0
q_2	q_2	q ₂	1
q ₃	q_1	q ₁	0

3. a) Transition state is given, derive the regular expression :



b) Get the optimized DFA for the regular expression defined by the grammar : $S \rightarrow aA \mid bA$ $A \rightarrow aA \mid 1A \mid bA \mid \in$

- Prove that the language : 4. a) 4 $L = \{a^m b^n / m \neq n\}$ is not a regular language. b) Convert the following regular expression to DFA : 8 $(0/1)^* 011$ Using identify rules prove the following : c) 4 $(1+00^*1)+(1+00^*1)(0+10^*1)^*$ $(0+10^*1)=0^*1(0+10^*1)^*$ 5. 8 Convert the following grammar to GNF: a) $S \rightarrow ABA \mid BA \mid AB \mid AA \mid A \mid B$ $A \rightarrow aA \mid b$ $C \rightarrow bB | b$
 - b) Obtain an equivalent grammar containing no useless symbols from the following grammar.

 $A \rightarrow XYz/Xyzz$ $X \rightarrow Xy/xXx$ $Y \rightarrow yYy/Xz$ $Z \rightarrow Zy/z$

c) Show that CFG with production $S \rightarrow a |Sa|bSS|SSb|SbS$ is ambiguous.

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6.	a)	Design a PDA m, such that $L = \{a^n b^{2n}/n > 0\}$ and prove that any w belongs to L ie $W \in L(m)$ where w is in the form of $\{a^n b^{2n}\}$.	8
	b)	Find a grammar in CNF equivalent to : $S \rightarrow a Ab B$ $A \rightarrow q A q$ $B \rightarrow bB b$	8
7.	a)	Construct the to accept the following language : $L = \{X/x \in (a+b)^*, n_a(x) = n_b(x)\} \text{ where,}$ $n_a(x) \text{ is number of a's in } X.$ $n_b(x) \text{ is number of b's in } X.$	8
	b)	Write short note on the following :i) Counter Machine.ii) Halting Problem.	8
		OR	
8.	a)	What are various types of TM. Explain each type in brief.	8
	b)	Construct a TM that accepts the following function : f(m,n) = m - n if $m > n= 0$ if $m <= n$	8
9.	a)	Show that the following function are primitive recursive : i) $f(m,n) = 2m + 3n$ ii) $f(m,n) = m^{2n}$	8
	b)	Explain what is meant by unbounded minimalization and bounded minimalization.	8
		OR	
10.	a)	 Write short note : i) Primitive Recursive function. ii) Undecidability of a problem. 	8
	b)	Does a PCP with two links $X = (b, bab^3, ba)$ and $Y = (b^3, ba, a)$ have a solution? Explain.	8
