D .,,836 (Pages : 2) Name.....

Reg. **No**.....

FIRST SEMESTER M.Sc. DEGREE EXAMINATION, JANUARY 2011

CSC1C04—THEORETICAL COMPUTER SCIENCE

(2010 admissions)

Time : Three Hours Maximum Weightage : 36

I. Answer *all* questions :

1 Find a grammar for the language L = {w : |w| mod 3 ≠ |w| mod 2} 'on E = {a} .

2 Give grammar that generates all real constants in c.

3 For ∑ = {a,b} construct dfa that accept the sets consisting of all strings with exactly 2 a's and more than 2 b's.

4 Find regular expression for the language "all strings containing no more than three a's on ∑ = {a, b, c} .

5 Find a regular grammar that generate the language L(aa*(ab+a)*).

6 Show that L = {wwR : w E ∑*} is not regular.

7 Find CFG for L = {anbm : n m + 0, m : 0} .

8 Convert the grammar with productions :

S → abAB

A → bAB IX

B → BAa |A|λ **in to** CNF.

9 Construct an NPDA **that accept L = L** (aaa*b).

10 Show that L = {a'' b c^m $n \neq m$ is not context free.

11 Find a LBA **that accept L** = {a : n = **m2 ; m 1}.**

12 Write a short note on church's hypothesis.

(12 x 1 = 12)

Turn over

II. Answer any *six* questions :

13 Obtain PDNF and PCNF of (Q n R S) V (RVS)

14 Determine the validity of the following arguments.

"If you study well then you will pass in your exam".

"Not study well ; you will not pass in your exam".

15 Write a note on halting problem.

16 Explain traveling salesman problem with example.

17 Find a linear bounded automation that accept the language $L = \{a^n : n \geq 0\}$.

18 Write note on space complexity and time complexity.

19 Write and explain CYK algorithm.

20 Define regular expression with example.

21 Explain Chomsky hierarchy of languages.

(6 x 2 = 12)

III. Answer any *three* questions :

22 State and prove pumping lemma for regular languages. Using pumping lemma show that

L = $\{a^n b^n ; n \geq 0\}$ **is not regular.**

23 Let L be a CFG. Show that there exist a PDA, M such that L = N (M).

24 Define a turing machine. Explain working of turing machine as a transducer.

25 Show that family of CFG is closed under union concatenation and star closure.

26 Define NP complete language. Show that satisfiability problem is NP complete.

27 Prove that there exists no algorithm for deciding whether any given CFG is ambiguous.

(3 x 4 =