

I-1. sem V

616107

Con. 3133-07.

## Automata theory

ND-1237

(REVISED COURSE)

(3 Hours)

[Total Marks : 100

N.B. : (1) Question No. 1 is compulsory.

(2) Answer any four out of the remaining six questions.

1. (a) Distinguish between NPDA and DPDA. Give one example of each. 5  
 (b) Design a FSM for testing divisibility by 4. 5  
 (c) Design a Mealy M/C to change vowels to uppercase. 5  
 (d) Design a TM to accept  $ab^n cd^n$ . 5
2. (a) Design an operator precedence parser for logical operators  $\Rightarrow$  &,  $\uparrow$ , &&,  $\parallel$ ,  $=$ ,  $(, )$  and 'id'. 10  
 (b) Design a TM to compute  $\log_2^n$ . 10
3. (a) Design a NFA to accept strings over  $\{0, 1\}$  and not ending with "101". Convert the same to a reduced DFA. 12  
 (b) Design a PDA to accept odd palindromes over  $\{a, b, c\}$  of the form  $WcW^R$  and  $W$  over  $\{a, b\}$ . 8
4. (a) Design a TM to accept a Language over  $\{a, b\}$  such that number of a's  $>$  number of b's. 10  
 (b) Convert the following to GNF :  $S \rightarrow 11 S/00 S/11/00/E$  10
5. (a) Design a TM to divide a number and generate quotient and remainder. 12  
 i.e.  $i/p \Rightarrow \frac{A; B}{Q \leftarrow A/B}$        $O/P \Rightarrow \frac{Q; R}{R \leftarrow A \text{ mod } B}$   
 where A, B, Q and R are unary numbers.  
 (b) Use pumping lemma to show the following is context free— 8  
 $L = \{ x / x = 0^n, 2^n \}$   
 $n > 0$
6. (a) Design a parser for accepting postfix arithmetic expressions. 12  
 (b) Explain Universal TM, Halting problem, Unsolvability. 8
7. Write short notes on any five of the following :— 20  
 (a) CNF  
 (b) Moore M/C  
 (c) Pumping lemma  
 (d) Ambiguous grammars  
 (e) Power of NPDA  
 (f) Applications of FSM's