A 1121

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2006.

Fifth Semester

Computer Science and Engineering

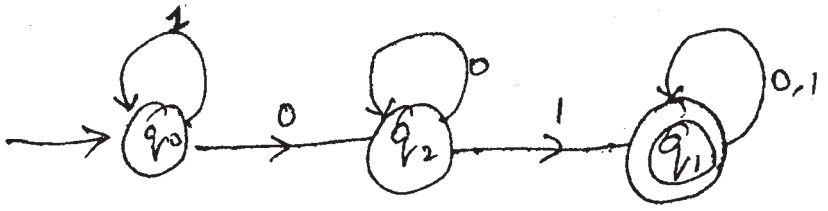
CS 332 — THEORY OF COMPUTATION

Time : Three hours Maximum : 100 marks

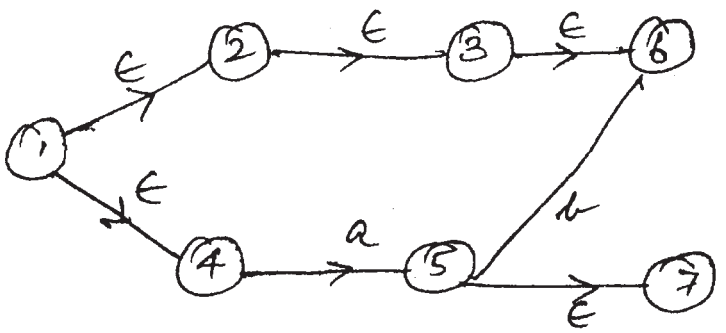
Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Find the language accepted by the DFA given below.



2. Find the $\in$–closure of the states 1, 2 and 4 in the following transition diagram.



3. For the grammar $S \rightarrow A1B$, $A \rightarrow OA/\in$, $B \rightarrow OB/1B/\in$, give left most and right most derivation of the following string 00101.

4. Construct CFG to generate $\{a^n b^n / n \in Z^+\}$.

5. Is it true that deterministic push down automata and non deterministic push down automata are equivalent in the sense of language of acceptances? Justify your answer.

6. Define instantaneous description of a PDA.

7. Define basic turing machine.

8. Explain the multitape turing machine mode. Is it more power than the ba turing machine? Justify your answer.

9. When a problem is said to be undecidable? Give an example of a decidal problem.

10. Show that union of recursive language is recursive.

PART B — (5 × 16 = 80 marks)

11. (i) Construct the equivalent Greibach normal form for the CF $G = \{A_1, A_2, A_3\}, \{a, G\}, P_1 A_1\}$ when P consists of the following : (1

$$A_1 \longrightarrow A_2 A_3$$
$$A_2 \longrightarrow A_3 A_1 / b$$
$$A_3 \longrightarrow A_1 A_2 / a.$$

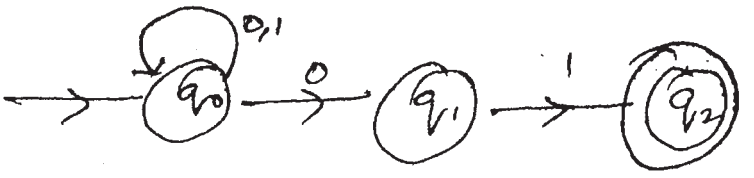
(ii) Show that the language $\{0^n 1^n 2^n / n \geq 1\}$ is not context free. (

12. (a) (i) Construct an NFA equivalent to the following regular expressio $((10) + (0+1))^* 01$. (1

(ii) Check whether the language $L = \{0^{n^2} / n \in Z^+\}$ is regular or not Justify your answer. (

Or

(b) (i) Construct DFA equivalent to the NFA given below : (



(ii) Prove that if $L = L(A)$ for some DFA A, then there is a regula expression R such that $L = L(R)$. (1

13. (a) (i) Prove that if L is a context–free language then there exists a PDA on such that $L = N(M)$. (12)

(ii) Explain different types of acceptance of a PDA. Are they equivalent in sense of language acceptance? Justify your answer. (4)

Or

(b) If L is $N(M)$ for some PDA M, then prove that L is context–free language. (16)

14. (a) (i) Design TM to accept the language $L = \{0^n 1^n / n \geq 1\}$. (10)

(ii) Explain with an example how the finite control of a TM can be used to hold a finite amount of information. (6)

Or

(b) (i) Explain how a turing machine can be viewed as a computing device on functions involving integers. (4)

(ii) Design a TM to computer $f(m, n) = m * n$, $\forall m, n \in Z^+$ by using the subroutines. (12)

15. (a) Show that the language L_μ is recursively enumerable but not recursive. (16)

Or

(b) (i) Define the language L_d. Show that L_d is neither recursive nor recursively enumerable. (12)

(ii) Show that if a language L and its complement $\overline{L}$ are both recursively enumerable then L is recursive. (4)
