APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIRST SEMESTER M.TECH DEGREE EXAMINATION
Computer Science and Engineering
(Computer Science and Systems Engineering)
04 CS 6405 - Automata Theory and Computability

Time: 3 hrs Max. Marks: 60

PART A

(Answer all questions. Each question carry 3 marks).

1. Design a DFA over $\{a, /, *\}$which end in a C-Style comment. (3)
2. Give a regular expression for the language L=$\{w\epsilon(a,b)^*\}$ such that no two a's and no two b's come together in w. (3)
3. Give the language represented by the regular expression. (3)

$$1(0+1)^* + (1+0)^*0$$

4. What is Ultimately Periodic Set? (3)
5. What is the language represented by the following Context Free Grammar? (3)

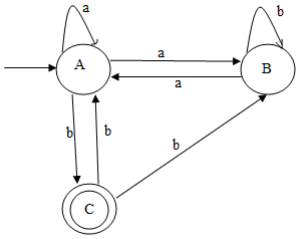
$$S- > aSb/bSa/\epsilon$$

6. What are Null Productions?What is their effect on deciding whether a given string is present in a given language or not of Context Free Language? (3)
7. How the Universal Turing Machine works? (3)
8. Let T be a Turing Machine, give the formal definition of T. (3)

PART B

(Each full question carries 6 marks).

9. Convert the following NFA into its equivalent DFA. (6)



OR

10. Design an NFA for the language over (0,1) with set of all strings that end with 01 and convert it into equivalent DFA. (6)

11. Convert the given CFG to CNF. (6)

$$S->aSb/bSa/\epsilon$$

OR

12. Obtain a reduced grammar equivalent to the grammar G having the productions. (Remove useless, null and unit productions) (6)

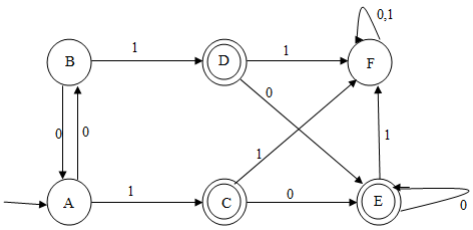
$$S->AC/B$$

$$A->a$$

$$C->c/BC$$

$$E->aA/e$$

13. Obtain the unique minimal DFA corresponding to the canonical Myhill Nerode relation representing the language by the following DFA. (6)



OR

14. Prove that the language L=$\{a^n b^n | n > 0\}$ is not regular using Pumping Lemma. (6)

15. Give a PDA(accepts by final state) accepting the language L=$\{a^n b^n c^m | n, m \geq 1\}$.(It is enough to give the set of transitions or the transition graph). (6)

OR

16. Give a PDA(accepts by final state) accepting the language L=$\{a^n b^{2n} | n \geq 1\}$.(It is enough to give the set of transitions or the transition graph). (6)

17. Design a Turing Machine to recognise the language L=$\{w\text{II}w\}$ where the first half is repeated in the second half and II is the separation between them.(It is enough to give the set of transitions or the transition graph). (6)

OR

18. Design a Turing Machine to recognise the language L=$\{a^n b^n c^n | n \geq 0\}$. (It is enough to give the set of transitions or the transition graph). (6)

19. State and prove Rice's Second Theorem. (6)

OR

20. State and prove the the theorem which shows M such that M accepts an infinite language is undecidable. (6)