Indian Institute of Technology Jodhpur
B.Tech. 3rd Year (CSE) 1st Sem., Ist Mid Sem. Exam-2015
CS-222: Theory of Computation

Duration: 60 minutes   Maximum Marks 20

Instructions:

(a) Answer each question supported with detailed reasoning/steps/algorithms.

(b) Do the rough-work on separate page, preferably on last page of answer sheet, which should be canceled by you at the end.

(c) Use the standard convention of symbols.

(d) All the questions are complete in every respect, carrying no ambiguity. Hence, they do not need any further clarifications.

1. Construct a minimized homomorphic DFA for the DFA shown in figure 1, such that number of states in the new DFA are less than original. Also find out the regular expression for the language accepted by this DFA.
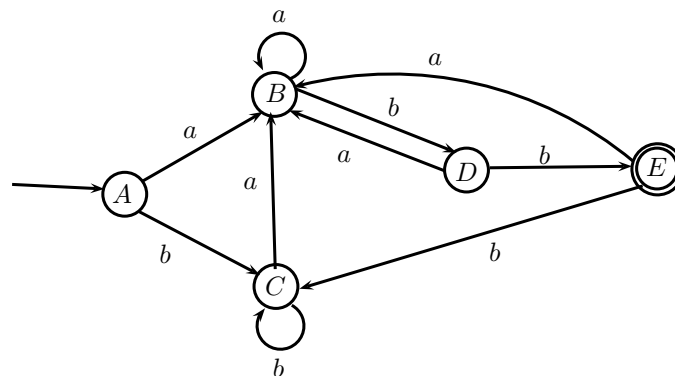
(5)

Figure 1: DFA.

2. Prove that if a language and its complement are both recursively enumerable, then the language is recursive. (3)

3. Draw the transition diagrams for nondeterministic finite automata which accepts following languages.

   (a) $((ab \cup aab)^* a^*)^*$ (3)

   (b) $(ab)^* (ba)^* \cup aa^*$ (3)

4. Describe a simple procedure for enumerating all the sentences of a recursive language. (3)

5. How many distinct DFAs can be there, each having n number of states over an alphabet having total k number of distinct symbols ? (3)