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Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

Course Code: CS301

Course Name: THEORY OF COMPUTATION (CS)

Max. Marks: 100

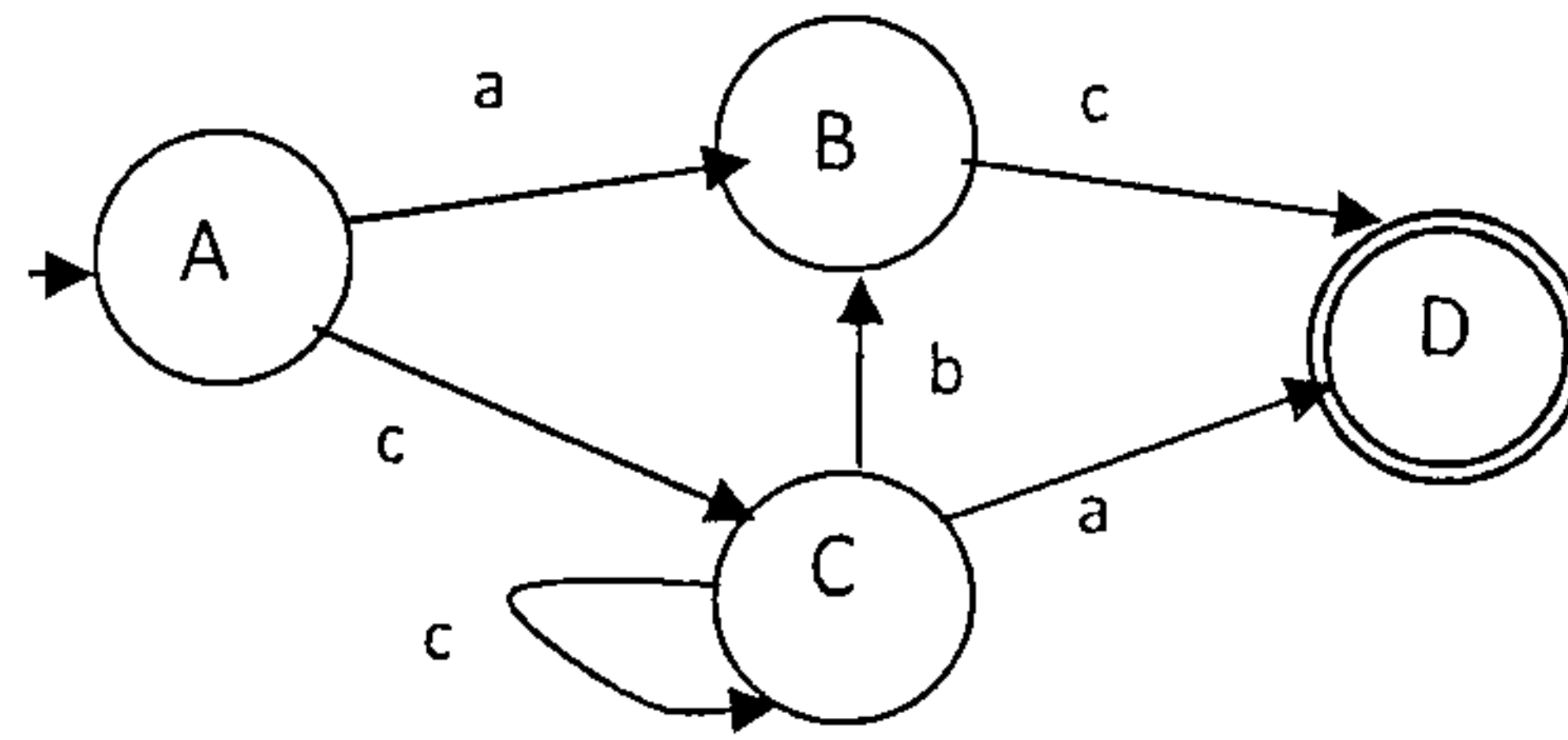
Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

Marks

- 1 What is the regular expression for the DFA (3)

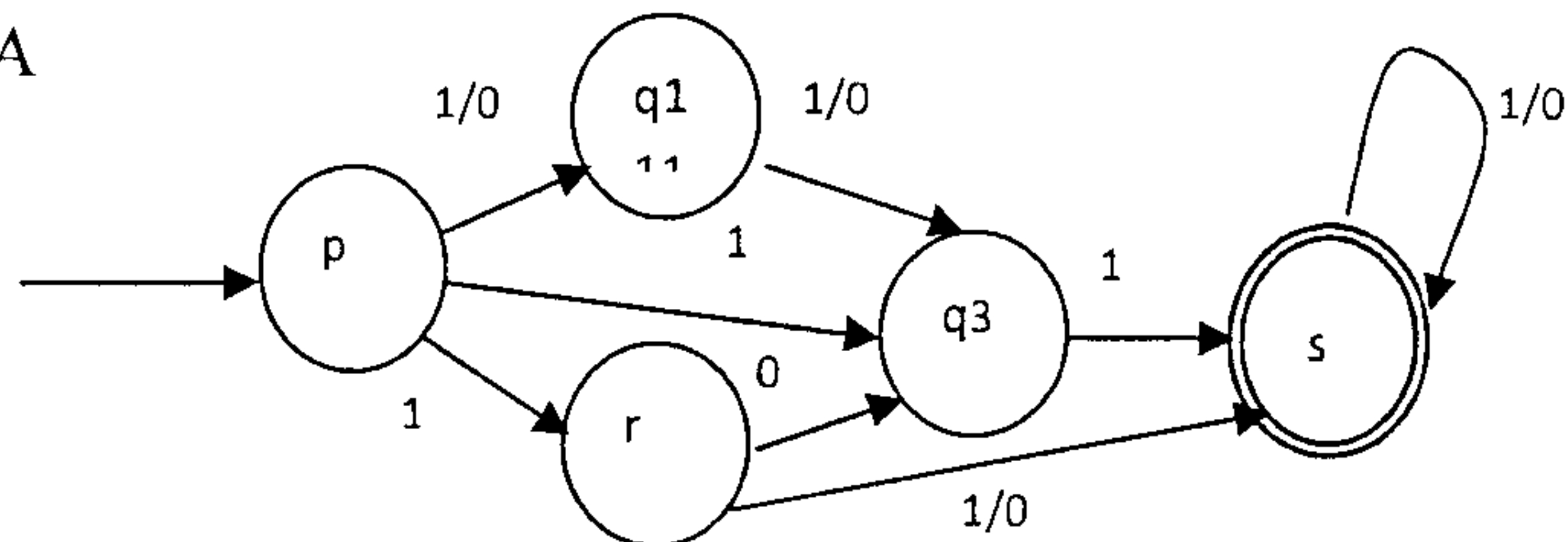


- 2 Compare the transition functions of NFA and DFA. (3)
- 3 Explain in English language the language accepted by the DFA in Question 1. (3)
- 4 What is a Moore machine? How is it different from mealy machine? (3)

PART B

Answer any two full questions, each carries 9 marks.

- 5 a) Convert the NFA to DFA (4.5)



- b) Prove the equivalence of regular expression and Finite state automata. (4.5)
- 6 a) Prove the equivalence of NFA and ϵ -NFA. (4.5)
- b) Draw a six state DFA which can be minimized to a three state DFA where set of input symbols is $\{a, b, c\}$. Draw both the DFAs. Assume whatever is required. (4.5)
- 7 a) Prove the equivalence of NFA and DFA. (4.5)
- b) What is Myhill Nerode Theorem? (4.5)

PART C

Answer all questions, each carries 3 marks.

- 8 What is a derivation tree? (3)

- 9 Is the grammar $\{E \rightarrow E+E | E-E | \epsilon\}$ ambiguous? Why? (3)
- 10 What is the difference between NPDA and DPDA? (3)
- 11 Is the language ww^R where w is string of zeroes and ones, accepted by DPDA? (3)
Why?

PART D

Answer any two full questions, each carries 9 marks.

- 12 a) Show that $L = \{0^p \mid p \text{ is a prime number}\}$ is not regular. (4.5)
- b) Construct the CFG for the union of the languages $0^n 1^n$ and $a^n b^n$ for $n > 0$. (4.5)
- 13 a) Convert the grammar $\{S \rightarrow AaCb | ABa, A \rightarrow bAa | a, B \rightarrow BaB | b, C \rightarrow c\}$ to (4.5)
Chomsky normal form.
- b) Construct the PDA for the language $\{0^n 1^n\}^*$. (4.5)
- 14 a) Give the formal definition of an NPDA. (3)
- b) Show that NPDA and CFG are equivalent. (6)

PART E

Answer any four full questions, each carries 10 marks.

- 15 a) Consider $L = \{ww \mid w \in \{0, 1\}^*\}$. Prove L is not a CFL. (5)
- b) Explain Chomsky hierarchy and corresponding type 0, type 1, type 2 and type 3 formalism. (5)
- 16 a) Design a Turing machine that determines whether the binary input string is of odd parity or not (5)
- b) How does the Universal Turing machine simulate other Turing machines? (5)
- 17 a) Design a Turing machine that accepts $a^n b^m$ where $n > 0$ and $m > n$. (5)
- b) Explain why Halting problem is unsolvable problem. (5)
- 18 a) What is the instantaneous description for a Turing machine? Explain with an example. (5)
- b) Show that normal single tape Turing machine can perform computations performed by multi-tape Turing machine (informal explanation is sufficient). (5)
- 19 a) What is a recursive language? Give an example. (5)
- b) How does a Turing machine differ from PDA and FSA? (5)
- 20 a) State pumping lemma for CFL. Mention one application of Pumping lemma (5)
- b) What is a non-deterministic Turing machine? (5)
