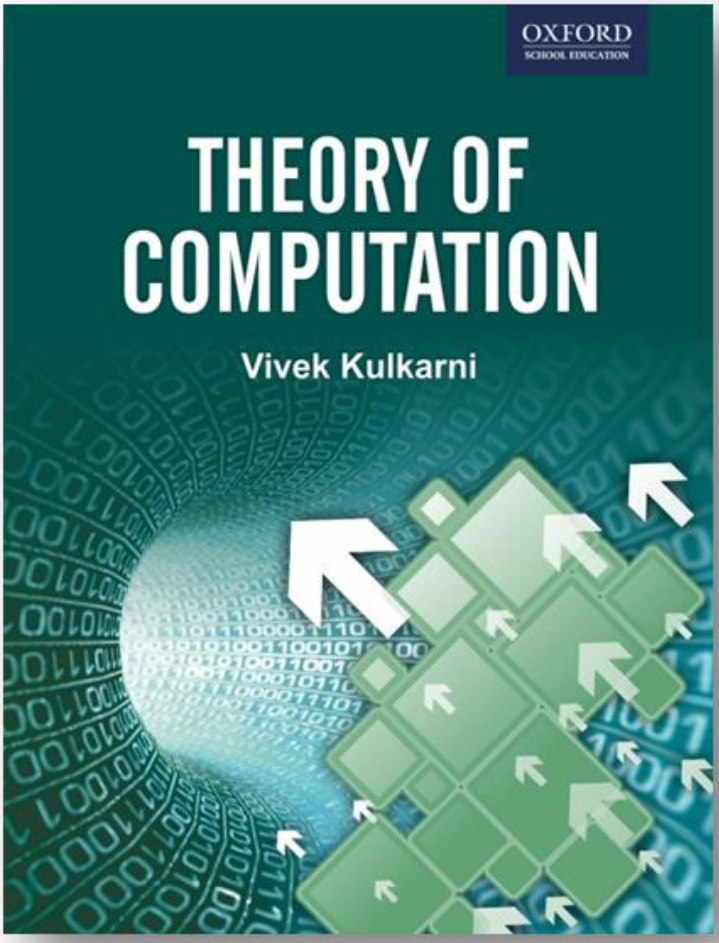

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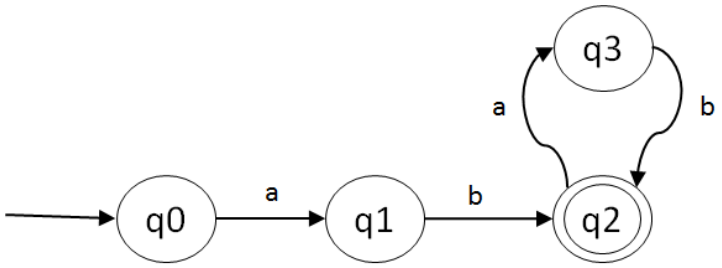
Solution for

Model Question Paper 4

(From Appendix B)

Q.1 a) The regular expression for the language can be written as, *ab (ab)**. The DFA for the same can be drawn as follows,



We can see that the DFA accepts at least one occurrence of '*ab*'.

Q.1 b) Refer to the example 2.22 from the book.

Q.1 c) Refer to the example 2.3 from the book.

Q.2 a)

(a) [(0+1*)* 00 (0+1)*] *

(b) (0 +∈) (1+10)*

(c) (10 + 01) (0+1)*

(d) (00)* 1 (11)*

Q.2 b) (i) 'grep' utility in UNIX: Refer to the section 3.8.3.

(ii) Finding pattern in text: Refer to the section 3.8.2.

Q.2 c)

(1) The statement 'baa ∈ a* b* a* b*' is TRUE.

If we try listing the strings denoted by the regular expression, 'baa' is part of it.

L = {∈, a, b, aa, bb, ab, ba, aaa, bbb, abb, baa, aba, …}

(2) b*a* ∩ a* b* = a* ∪ b* is TRUE.

Let, *r1* = b*a*. Then, *L(r1)* = {∈, b, a, aa, bb, ba, aaa, bbb, baa, bba, …}

Let *r2* = a* b*. Then *L(r2)* = {∈, a, b, aa, bb, ab, aaa, bbb, abb, aab, …}

Therefore, *L(r1)* ∩ *L(r1)* = {∈, a, b, aa, bb, aaa, bbb, …} which is same as a* ∪ b*.

(3) a* b* ∩ b * c* = ϕ is FALSE.

Let *r1* = a* b*. Then *L(r1)* = {∈, a, b, aa, bb, ab, aaa, bbb, abb, aab, …}

Let *r2* = b* c*. Then *L(r2)* = {∈, b, c, bb, cc, bc, bbb, ccc, bcc, bbc, …}

Therefore, *L(r1)* ∩ *L(r1)* = {∈, b, bb, bbb, …} which is *b** ≠ ϕ.

(4) abcd ∈(a(cd)* b)* is FALSE.

Let *L* be the language denoted by the given RE, [*a* (*cd*)* *b*]* then,

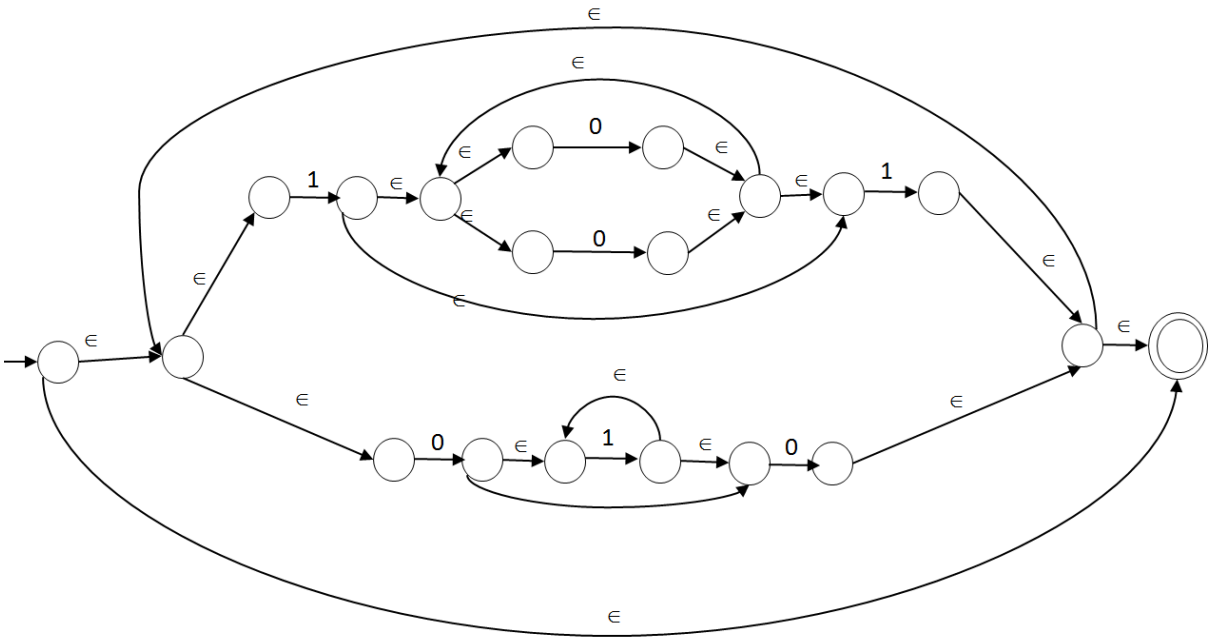
L = {∈, ab, abab, acdb, acdcdb, acdbacdb, abacdb, ... }

'abcd' does not belong to language *L*.

Q.2 d) Refer to the section 2.12.1.

OR

Q.2 a) The required transition graph is,



Q.2 b) Refer to the example 3.40 from the book.

Q.2 c) Refer to the example 3.43 from the book.

Q.3 a) Refer to the section 5.11.

Q.3 b) Refer to the example 5.44 from the book.

Q.3 c) Refer to the section 5.18.

Q.4 a) Refer to the example 6.4 from the book.

Q.4 b) Refer to the section 6.6.1.

Q.4 c) The given CFG is,

$S \rightarrow a\ B \mid b\ A$

$A \rightarrow a \mid a\ S \mid b\ A\ A$

$B \rightarrow b \mid b\ S \mid a\ B\ B$

Let us convert the grammar to CNF which is suitable for drawing the PDA. The modified grammar is,

$S \rightarrow P\ B \mid Q\ A$

$A \rightarrow a \mid P\ S \mid Q\ R$

$B \rightarrow b \mid Q\ S \mid P\ T$

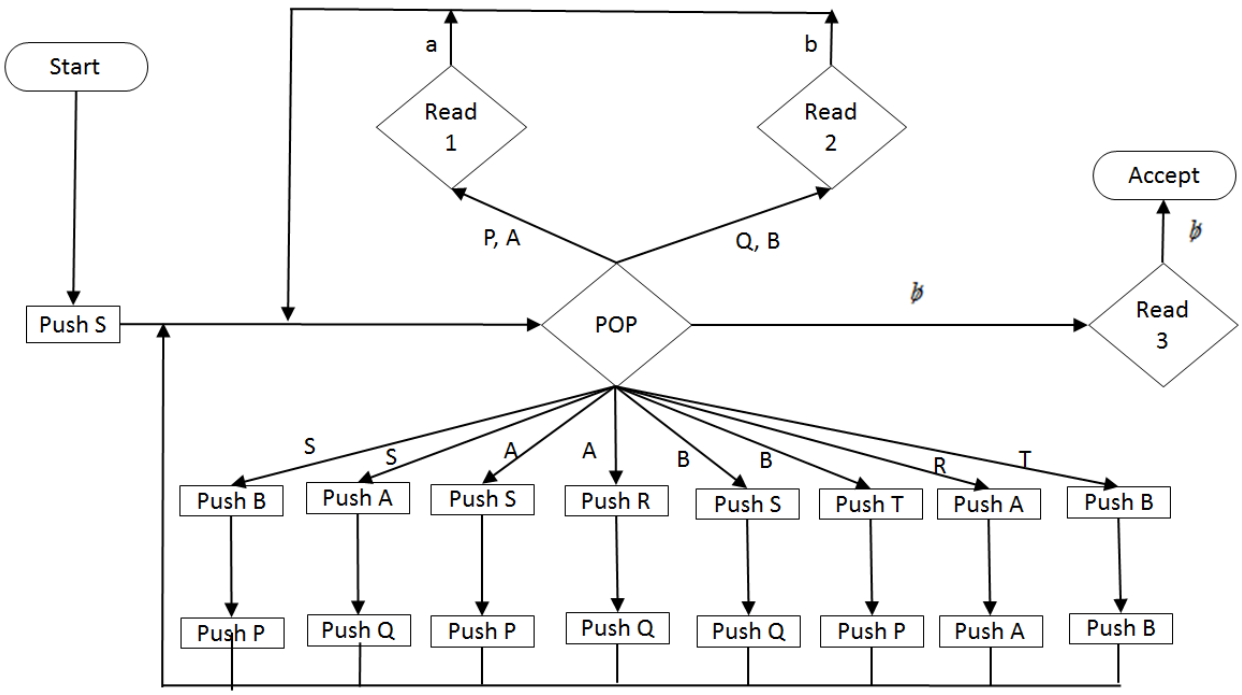
$R \rightarrow A\ A$

$T \rightarrow B\ B$

$P \rightarrow a$

$Q \rightarrow$ b

The PDA can be drawn as below,



Q.5 a) Refer to the example 4.8 from the book.

Q.5 b) Refer to the section 4.8.

Q.5 c) Refer to the section 4.20.

Q.5 d) Refer to the section 4.18.

Q.6 a) Refer to the example 8.7 from the book.

Q.6 b) Refer to the section 4.11 for understanding the halting problem. Refer to the section 10.3.3.4 to find out why it is NP-hard.

Q.6 c) Refer to the section 9.11.

Q.6 d) Refer to the example 4.12 from the book.

