Sindh Madressatul Islam University (SMIU)

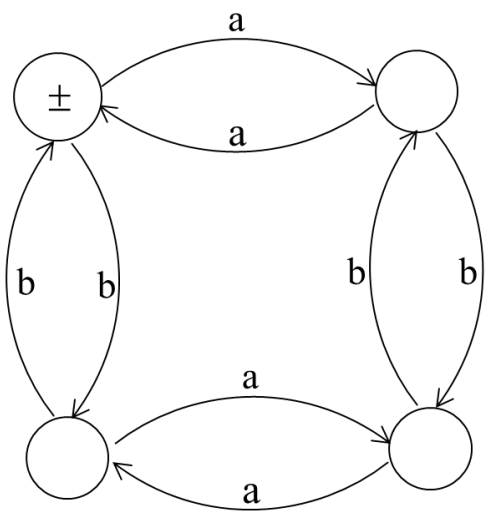
Program: BSCS (Even)
Subject: Theory of Automata
Instructor: Mustafa Ali Bamboat

Quiz – 4
02-JAN-2024

30 minutes

Q1.

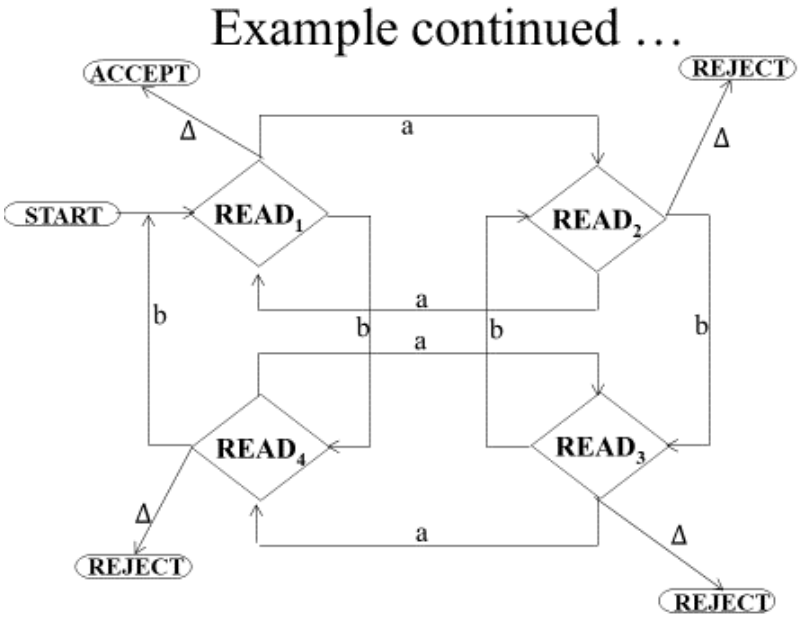
Consider the following FA corresponding to the EVEN-EVEN language.



Draw Push Down Automata (PDA) machine, including the REJECT states.

Answer:

Sindh Madressatul Islam University (SMIU)



Q2. The following Context Free Grammar has null production long with unit production, you are required to convert the CFG to CNF.

S → ASB

A → aAS|a|Λ

B → SbS|A|bb

Answer:

Step-1 remove nullable productions

S → AS|SB|S|ASB

A → aAS|aS|a

B → SbS|A|bb

Step-2 remove unit productions

S → AS|SB|ASB

A → aAS|aS|a

B → SbS|bb|aAS|aS|a

Note S has unit production as S→S, so you replace with the same productions excluding S only from the R.H.S.

Step-3 remove more than one terminals/more than two non-terminals from R.H.S (as per definition of CNF).

S → AS|SB|ASB

A → XAS|XS|a

B → SYS|bb|XAS|XS|a

X → a

Y → b

Also remove $B \rightarrow bb$

S → AS|SB|ASB

A → XAS|XS|a

B → SYS|VV|XAS|XS|a

X → a

Y → b

V → b

Remove $S \rightarrow ASB$

S → AS|SB|PB

A → XAS|XS|a

B → SYS|VV|XAS|XS|a

X → a

Y → b

V → b

P → AS

Remove $A \rightarrow XAS$

S → AS|SB|PB

A → RS|XS|a

B → SYS|VV|XAS|XS|a

X → a

Y → b

V → b

P → AS

R → XA

Remove $B \rightarrow SYS$

S → AS|SB|PB

A → RS|XS|a

B → TS|VV|XAS|XS|a

X → a

Y → b

V → b

P → AS

R → XA

T → SY

Remove $B \rightarrow XAS$

S → AS|SB|PB

A → RS|XS|a

B → TS|VV|US|XS|a

X → a

Y → b

V → b

P → AS

R → XA

T → SY

U → XA