

Solutions

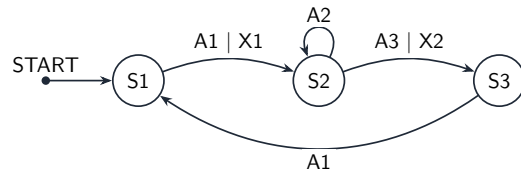
2.1 X1; S2; A3.

2.2 A circle labelled S4 with an arrow looping back to S4, labelled A3 without an output.



2.3 Final state S3. Outputs X1, X2. Each A2 stays in S2 and produces no output.

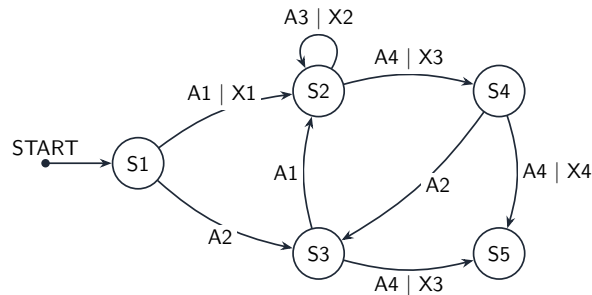
2.4 (a)



START into S1 and all three labelled states; S1 to S2 with A1 | X1; S2 self-loop A2 and S2 to S3 with A3 | X2; S3 to S1 labelled A1 only.

(b) In S1, A1 produces X1. In S3, A1 produces no output. The transition is determined by both the current state and the input, not the input alone.

3.1

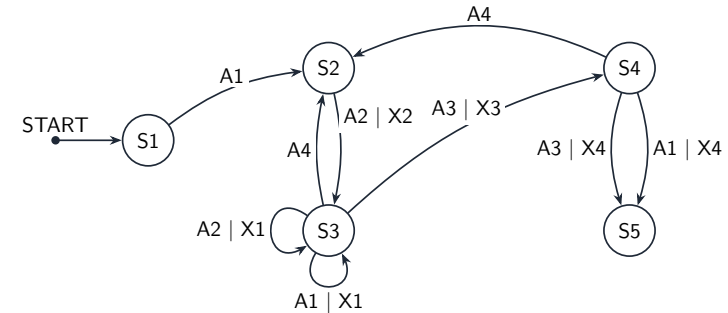


Correct missing state names; S1 to S3 labelled A2; both outgoing S2 transitions including its loop; both outgoing S3 transitions; both outgoing S4 transitions with correct labels. S5 has no outgoing transition in the table.

3.2 Award one mark for each error with its correction:

- The S2 to S3 arrow labelled A2 | X2 is wrong: replace it with a self-loop on S2 labelled A2, with no output.
- The required S2 to S3 arrow labelled A3 | X2 is missing: add it.
- The S3 to S2 arrow labelled A3 | X3 has no matching table row: remove it.
- The A4 | X4 self-loop on S3 is wrong: replace it with an arrow S3 to S1 labelled A4 only.

3.3 (a) START into S1 and all five state names; S1 to S2 and S2 to S3 correctly labelled; both S3 self-loops and S3 to S4; S3 to S2 and S4 to S2, each labelled A4 only; both S4 to S5 input-output pairs. No outgoing arrows from S5.



(b) The states after each input are S2, S3, S3, S3, S4, S2. Final state **S2**; outputs **X2**, **X1**, **X1**, **X3**. The first A1 and last A4 produce no output.