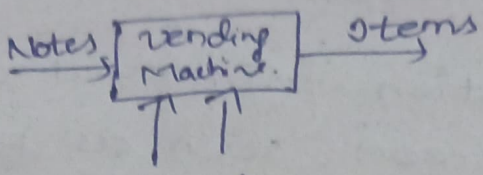
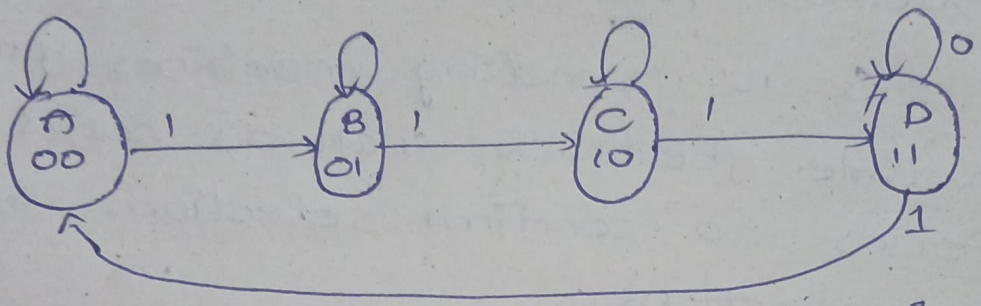
Block diagram



State Diagram



x → input signal
z → output signal

P-S			N.S				Required FF input.			
	Q_1	Q_0	x	name	Q_1	Q_0	z	J_1	K_1	J_0	K_0
A	0	0	0	A	0	0	0	0	x	0	x
A	0	0	1	B	0	1	0	0	x	1	x
B	0	1	0	B	0	1	0	0	x	x	0
B	0	1	1	C	1	0	0	1	x	x	1
C	1	0	0	C	1	0	0	x	0	0	x
C	1	0	1	D	1	1	0	x	0	1	x
D	1	1	0	D	1	1	0	x	0	x	0
D	1	1	1	A	0	0	1	x	1	x	1

JK F.F

Q_t	Q_{t+1}	J	K
0	0	0	x
0	1	1	x
1	0	x	1
1	1	x	0

3) Briefly explain the functionality of the FSM using the state diagram

1. Initial State

State: Idle

Description: The vending machine is waiting for a user to initiate a purchase

2. Accepting Note:

State: Accepting Note

Description: Transitions to this state when a user inserts a note

Transitions :-

- On Note 5 inserted: Move to state accepting Note (stay in the same state, waiting for additional notes or further action).
- On Note 10 inserted: Move to state accepting Note or transition to Dispensing if the required amount is reached.
- On Note 20 inserted: Move to state accepting Note or transition to dispensing if the required amount is reached.
- On Note 50 inserted: Move to state accepting note or transition to

dispensing if the required amount is reached.

3. Dispensing:
State: Dispensing
Description: The vending machine is dispensing the product
Transitions:
→ On successful dispensing transition to state change Given.
→ If the product is out of stock or any issue occurs, transition back to idle

4. Change Given
State: Change Given
Description: The vending machine is giving change if needed.
Transitions:
→ On completing the change process, transition back to idle.

5. Invalid Input Handing.
→ State: Error (or stay in the current state, depending on the design).
→ Description: Transition to an error state if an invalid input is detected (eg: unrecognized note, insufficient funds).
Transitions:
→ from error, transition back to idle after displaying an error message.