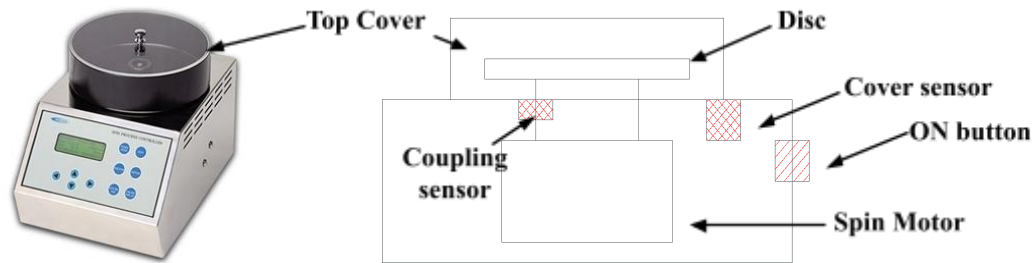


Q5. SET A

(a) In the fabrication process of a microfluidic system, a spin coater is used to deploy uniform coating of photoresist material on silicon wafer, as shown in Fig.Q5.



FigQ5: Spin coater with sensors and actuator

The spin coater uses a high rpm motor to spin the Silicon disc. There are sensors to detect, (i) closing of top cover and (ii) proper coupling of disc with the spin head and the ambient temperature. Create a digital logic circuit that automates the spin motor in the given conditions below, [3]

- First condition: Start button is ON, top cover is closed and proper coupling of disc with the spin head is detected, ambient temperature is permissible.
- Second condition: Start button is ON, top cover is open and proper coupling of disc with the spin head is not detected (or, there is no disc), ambient temperature is permissible or non-permissible.

The states of the sensors are defined as,

Sensor	State '1'	State '0'
Start button	ON	OFF
Top cover	Closed	Open
Ambient temperature	Permissible	Non- permissible

(b) Simplify the following Boolean expression using Karnaugh map.

[3]

$$Y = A B C D + A' B C D + A B' C D + A' B C' D + A B' C' D' + A' B' C' D'$$

