

**Question (100 marks)**

Given the problem description below, specify the **state machine** for the SpaManager system. Show the states as well as transitions including events and guards. Events may require parameters. You do not need to specify the actions of the SpaManager on transitions or in states.

**Problem Description: SpaManager System**

The SpaManager allows saunas and Jacuzzis to be controlled from a central management point. With SpaManager it is possible to turn a sauna or Jacuzzi on and off.

When a sauna is turned on, the stove in the sauna heats until a temperature of 90°C is reached, at which point the stove stops heating until the temperature falls below 85°C and consequently the stove starts heating again. As a safety feature, a humidity sensor monitors the sauna and activates a fan when the humidity exceeds the safety threshold of 40% for more than 3 minutes. The fan turns off automatically after 5 minutes. SpaManager also controls whether eucalyptus-infused water is poured over the stove to increase the humidity. Upon request from the user, a predetermined amount of water is dispersed, if the humidity is below the safety threshold and the fan is not active. At most, water is dispersed once every 15 minutes.

When a Jacuzzi is turned on, the jets of the Jacuzzi eject water at level 1 (the low pressure setting). This can be increased first to level 2 (medium pressure setting) and then to level 3 (high pressure setting). Similarly, the level can be reduced gradually from the highest to the lowest. Furthermore, the user can choose from twenty five different ejection patterns, which determine the order, frequency, and duration of active jets. All ejection patterns work for all three pressure levels. The Jacuzzi comes with a pause feature, which stops the jets from ejecting water for two minutes. The Jacuzzi can also be controlled via a panel attached to the Jacuzzi in the same way as it is controlled remotely from the central management point.