Following figure is a simple copy machine. A stop signal S is to be generated to stop the machine operation and energize an indicator light whenever either of the following conditions exists:

i)   There is no paper in the paper feeder tray
ii)   The two micro-switches in the paper path are activated, indicating a jam in the paper path.

The presence of paper in the feeder tray is indicated by a HIGH at logic signal P. Each of the micro switches produces a logic signal (Q & R) that goes HIGH whenever paper is passing over the switch to activate it. Design a logic circuit to produce a HIGH at output signal S for the stated conditions.
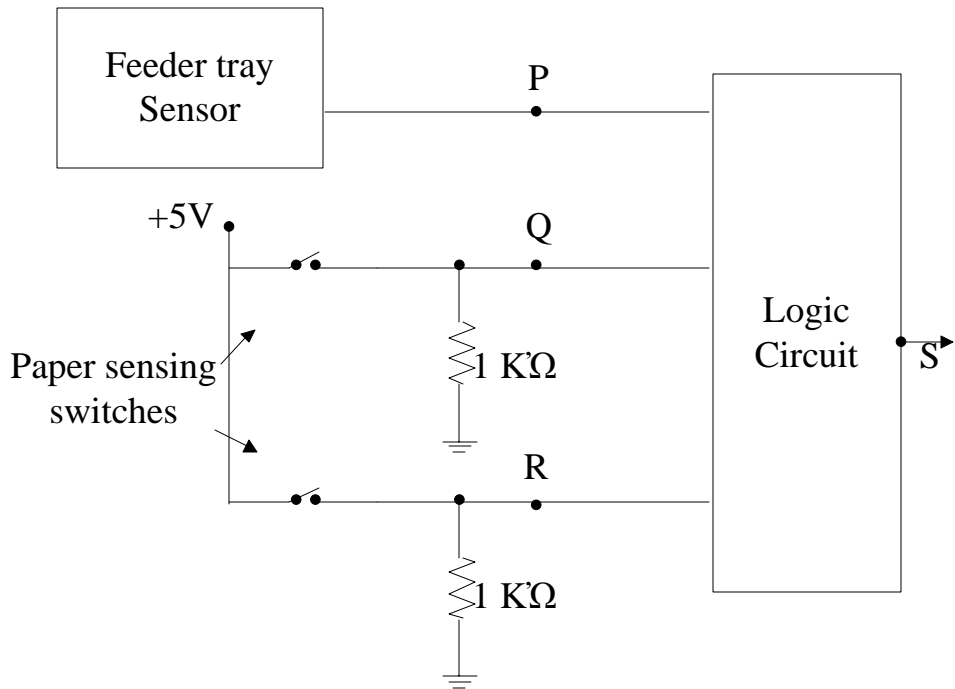
Solution:

The S output will be a logic 1 whenever P=0 because this indicates no paper in the paper feeder tray. S will also be a 1 for the two cases where Q and R both indicating a paper jam.

1. Truth Table :

Inputs			Output
P	Q	R	S
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

2. MAP :

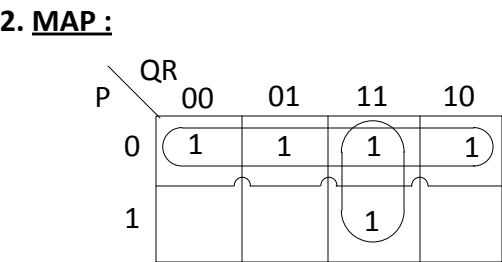| P \ QR	00	01	11	10
0	1	1	1	1
1			1	

Fig: Map for S

$$S = P' + QR$$

3. Circuit Diagram :