Conveyors

**Inputs:**
Start button S1 to start conveyor 1 (pulse signal)
Start button S2 to start conveyor 2 (pulse signal)
Stop button S3 to stop conveyor 1 (pulse signal)
Stop button S4 to stop conveyor 2 (pulse signal)
Emergency button S5 to stop all conveyors
(selector)

Sensor B1 (when ON it detects movement of conveyor 1; in case of failure of motor M1, B1 turns OFF as it detects no movement)
Sensor B2 (when ON it detects movement of conveyor 2; in case of failure of motor M2, B2 turns OFF as it detects no movement)

Outputs:
Motor M1 of conveyor 1
Motor M2 of conveyor 2
Motor M3 of conveyor 3
Lamp H1 (indicates the status of conveyor 1)
Lamp H2 (indicates the status of conveyor 2)
Lamp H3 (indicates the status of conveyor 3)
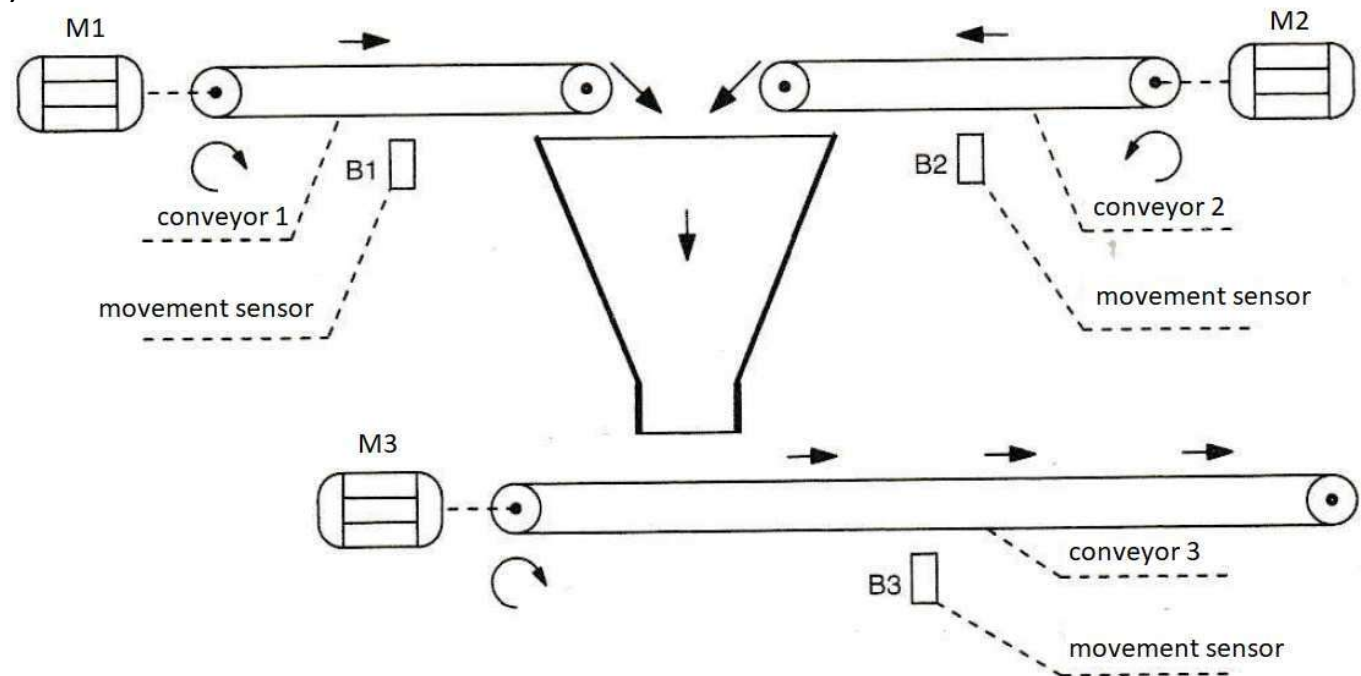
Activation of conveyors
- S1 commands M1; S2 commands M2
- Conveyors 1 and 2 cannot move contemporary
- Conveyor 3 is activated when conveyors 1 or 2 are active
- Lamps H1 and H2 are switched on when motors M1 and M2 are active respectively

Deactivation of conveyors
- S3 and S4 are pressed to stop conveyors 1 and 2 respectively; these must be arrested after 20 s
- Conveyor 3 is arrested 60 s after pressing S3 or S4

System operation
- Sensors B1 and B2 detect the movement of conveyors 1 and 2 respectively; during the start-up of conveyors, the signal of these sensors is not considered in the first 3 s
- In case, during the normal operation of conveyors 1 and 2, motor M1 or M2 has a failure, the motor must be de- activated and lamp H1 (or H2) must begin to flash
- In case of failure of M1 or M2, conveyor 3 must continue to move for 40 s before to stop and red lamp H3 must be enlighted

Assignment

Develop the automatic control to implement the task in Automation Studio programming, using both Ladder Code with the Step-Transition method and Grafcet code (subroutines in parallel, to manage different parts of the system).

The code must be well-organized, with the use of subroutines (FC, Partial GRAFCETs with various functionalities – forced, enclosed, …).

Moreover, develop a clear and understandable HMI interface in Automation Studio with: Start, Stop, Emergency, alarms, conveyors, objects, cylinders and whole system animation (movements and visibility)… and all sensors and pilot lights needed to simulate the real plant.

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