P7

PRACTICAL P7 · UNIT E8

Level-crossing lights

UNIT PROGRESS

AIM

Program and test a microcontroller level-crossing warning: when a train is detected, an amber light shows, then two red lights flash alternately a fixed number of times. The system checks again for ever.

YOU NEED

- ☐ Microcontroller board (PIC, Arduino or micro:bit) or a simulator
- ☐ Push switch (train sensor) + 10 kΩ pull-down
- ☐ 1 amber and 2 red LEDs, each with 330 Ω
- ☐ Stopwatch / phone timer, multimeter
- ☐ Or: CircuitClass flowchart mode (needs CircuitClass flowchart mode)

SHORT CIRCUIT

× WHAT EXAMINERS SAW

Decisions missing a '?', Yes/No labels or an arrow on the loop; delays without units.

✓ THE FIX

Check every decision: '?', Yes/No, arrow. Every delay: number and unit. Every output: pin number.

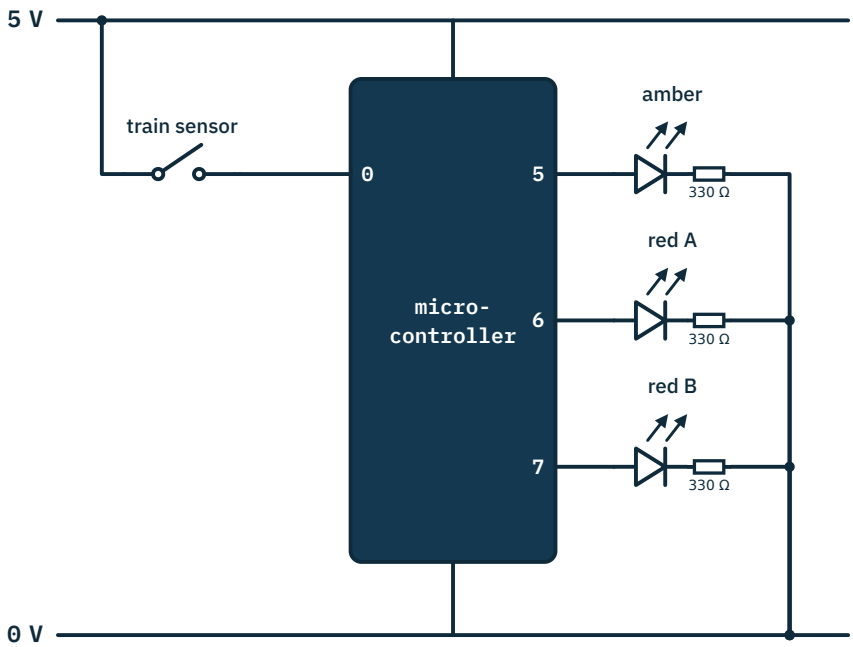
Course report 2026 Q12(a); MI 2025 Q9(a).

Specification

1. Train sensor: pin 0. Amber: pin 5. Red A: pin 6. Red B: pin 7.
2. When pin 0 is on: amber on for 3 s, then off.
3. Red A on 0.5 s, then Red B on 0.5 s (only one on at a time).
4. Repeat the red flash pair 10 times, then all off.
5. Go back and check the sensor again (continuous loop).

Level-crossing lights

Circuit



Sensor 5 V → pin 0; each LED from its pin to 0 V (with a 330 Ω resistor)

Your flowchart

Draw your flowchart before you program or simulate.

Level-crossing lights

Predict, then test

Test	Predicted outputs	Predicted time	Seen in simulation	Measured time	V_{out} at pin 6 (V)
1 sensor off					
2 sensor on					
3 after sequence					

Test results

Evaluate

EVALUATION FRAME

Specification point: The circuit should _____.

Result: When I _____, the _____ _____.

Cause and effect: This happened because _____, so _____.

Improvement: To fix the issue named in the task I would _____, so that _____.

Not for use during the assignment