

Commentary on candidate evidence

The candidate evidence has achieved the following marks for each task in this assignment.

Candidate 1

Task 1a

The candidate was awarded **2 marks**:

- ◆ for selecting an appropriate actuator – solenoid (**1 mark**)
- ◆ for justification in context of sensing train (**1 mark**)

Task 1b

The candidate was awarded **4 marks**:

- ◆ two pipes between cylinder and 5/2 valve (**1 mark**)
- ◆ not only restricting just exhaust air (**0 mark**)
- ◆ 3/2 valves connected to the 5/2 valve (**1 mark**)
- ◆ the push button and selected actuator on outstroking and instroking 3/2 valves respectively (**1 mark**)
- ◆ reservoir on instroking air to 5/2 valve (**1 mark**)

Task 2a

The candidate was awarded **3 marks**:

- ◆ all stages and symbols were noted in the flowchart (**1 mark**)
- ◆ flowchart pin numbers error with second decision and all output boxes (**0 mark**)
- ◆ selection of correct circuit components (**1 mark**)
- ◆ circuit wiring – incorrect battery orientation (**0 mark**)
- ◆ correct integration of flowchart and circuit (**1 mark**)

Task 2b

The candidate was awarded **1 mark** because the coding matched the flowchart in task 2a.

Task 2c

The candidate was awarded **4 marks**:

- ◆ initial test result had no comment on the effect on the motor (**0 mark**)
- ◆ planned amendment – diode flipped (**1 mark**)
- ◆ correct retest results based on circuit in 2d (**1 mark**)
- ◆ initial retest result has no statement on the LED and motor (**0 mark**)
- ◆ planned amendment described graphically in the flowchart sketch (**1 mark**)
- ◆ correct retest result for both tests (**1 mark**)

Task 2d

The candidate was awarded **2 marks**:

- ◆ for carrying out the first planned amendment – diode flipped (**1 mark**)
- ◆ for completing the second planned amendment – looping to the start of the flowchart (**1 mark**)

Task 3a(i)

The candidate was awarded **2 marks**:

- ◆ for identifying the correct input – outside light (**1 mark**)
- ◆ as both outputs are correctly labelled – light and movement (inferred by blinds open/closed) (**1 mark**)

Task 3a(ii)

The candidate was awarded **4 marks**:

- ◆ system boundary and boxes around all sub-systems (**1 mark**)
- ◆ motor in the output position (**1 mark**)
- ◆ lamp in the output position (**1 mark**)
- ◆ a driver per output – these are not individually joined to the microcontroller (**0 mark**)
- ◆ both limit switches are individually connected to microcontroller (**0 mark**)
- ◆ feedback loop after motor into the microcontroller via a limit switch with both arrows (**1 mark**)

Task 3b

The candidate was awarded **3 marks**:

- ◆ for the LDR symbol (**1 mark**)
- ◆ for the resistor symbol (**1 mark**)

- ◆ connecting components as a dark sensor (**1 mark**)

Task 3c

The candidate was awarded **1 mark**:

- ◆ there is no description of the effect on V_{out} when the light level is reduced (**0 mark**)
- ◆ for stating an appropriate planned test of the circuit in 3b – increase the light level (**1 mark**)
- ◆ no description was given for the effect on V_{out} caused by the candidate's planned test (**0 mark**)

Task 4a

The candidate was awarded **3 marks**:

- ◆ for justifying specification point i. met by referring to the use of a compound gear train (**1 mark**)
- ◆ for justifying the meeting of specification point ii. by referencing the gear directions (**1 mark**)
- ◆ for justifying that specification point iii. was not met through calculations to show a speed increase (**1 mark**)

Task 4b

The candidate was awarded **2 marks**:

- ◆ for a gear train with all gear sizes shown (**1 mark**)
- ◆ for producing a speed reduction of 16:1 (**1 mark**)

Task 4c

The candidate was awarded **2 marks**:

- ◆ for simulating the gear type shown in task 4b (**1 mark**)
- ◆ for simulating with the gear sizes in task 4b (**1 mark**)

Task 4d

The candidate was awarded **2 marks**:

- ◆ for the input and output speeds from task 4c (**1 mark**)
- ◆ for correct velocity ratio using input/output speeds (**1 mark**)

Task 5a

The candidate was awarded **2 marks**:

- ◆ for inverting input B (**1 mark**)
- ◆ for ANDing inputs A, B, and C (**1 mark**)

Task 5b

The candidate was awarded **2 marks**:

- ◆ $\bar{A} \cdot B \cdot C$ logic gate connections (**1 mark**)
- ◆ $A \cdot \bar{B} \cdot C$ logic gate connections (**1 mark**)

Task 5c

The candidate was awarded **2 marks**:

- ◆ for a valid modification suggested to the logic circuit (**1 mark**)
- ◆ for the justification of the suggested modification to the logic circuit (**1 mark**)

Total marks awarded – 41/50

Candidate 2

Task 1a

The candidate was awarded **2 marks**:

- ◆ for selecting an appropriate actuator – roller trim, the spelling was not penalised (**1 mark**)
- ◆ for justification of actuator in the context of detecting a train (**1 mark**)

Task 1b

The candidate was awarded **3 marks**:

- ◆ two pipes between the cylinder and the 5/2 valve (**1 mark**)
- ◆ not only restricting just exhaust air (**0 mark**)
- ◆ connecting both 3/2 valves to the 5/2 valve (**1 mark**)
- ◆ the push button and roller trip actuator shown on the correct 3/2 valve for the movement (**1 mark**)
- ◆ no reservoir on the instroking air to the 5/2 valve (**0 mark**)

Task 2a

The candidate was awarded **1 mark**:

- ◆ in the flowchart pin numbers are incorrect with 'set: outputs' command and no output 5 on (**0 mark**)
- ◆ there is no motor in any of the circuit components (**0 mark**)
- ◆ circuit wiring incorrect due to incorrect battery orientation (**0 mark**)
- ◆ integration of the flowchart and circuit (**1 mark**)

Task 2b

The candidate was awarded **0 marks** because they did not provide a high level code for the flowchart.

Task 2c

The candidate was awarded **1 mark**:

- ◆ the initial test result has no motor in the circuit (**0 mark**)
- ◆ for planned amendment – flipping diode the other way around (**1 mark**)
- ◆ retest results have no statement about adding a motor or evidence presented for task 2d (**0 mark**)
- ◆ in the second initial retest result there is no motor in task 2a, so this statement is incorrect (**0 mark**)

- ◆ the second planned amendment is incorrect and will return the diode to its original incorrect orientation (**0 mark**)
- ◆ the retest results statements are incorrect for evidence in task 2a (**0 mark**)

Task 2d

The candidate was awarded **0 marks** as they did not provide a modification to flowchart.

Task 3a(i)

The candidate was awarded **2 marks**:

- ◆ for identifying the correct input – sunlight (**1 mark**)
- ◆ both outputs are correctly labelled – light and movement (inferred by closed blind) (**1 mark**)

Task 3a(ii)

The candidate was awarded **2 marks**:

- ◆ no system boundary or boxes around all sub-systems (**0 mark**)
- ◆ no motor included (**0 mark**)
- ◆ the lamp(s) in an output position (**1 mark**)
- ◆ a driver per output as each lamp has a driver from the microcontroller (**1 mark**)
- ◆ no limit switch connected to the microcontroller (**0 mark**)
- ◆ lack of a correct feedback loop (**0 mark**)

Task 3b

The candidate was awarded **2 marks**:

- ◆ for the LDR symbol (**1 mark**)
- ◆ for the (variable) resistor symbol (**1 mark**)
- ◆ connecting components as a dark sensor because of the wiring is incomplete (**0 mark**)

Task 3c

The candidate was awarded **1 mark**:

- ◆ the description does not reference any effect on V_{out} by the reduction in the light level (**0 mark**)
- ◆ for an appropriate planned test – increase the light level (**1 mark**)

- ◆ there is no description of the effect on V_{out} caused by the candidate's planned test (**0 mark**)

Task 4a

The candidate was awarded **3 marks**:

- ◆ for justifying that specification point i. is not met by referring to gear A (60 tooth) being too big (**1 mark**)
- ◆ for justifying the satisfying of specification point ii. with reference to gear directions (**1 mark**)
- ◆ for justifying that specification point iii. was not met with reference to an increase in speed being produced (**1 mark**)

Task 4b

The candidate was awarded **1 mark**:

- ◆ for the gear train with all gear sizes shown (**1 mark**)
- ◆ due to the increase rather than reduction in output speed (**0 mark**)

Task 4c

The candidate was awarded **1 mark**:

- ◆ for simulating gear train type shown in task 4b (**1 mark**)
- ◆ the gear sizes do not match those in task 4b, evidenced from the speed graphs values (**0 mark**)

Task 4d

The candidate was awarded **1 mark**:

- ◆ input and output speeds from task 4c have not been used (**0 mark**)
- ◆ for velocity ratio based on given input/output speeds (**1 mark**)

Task 5a

The candidate was awarded **1 mark**:

- ◆ for inverting input B (**1 mark**)
- ◆ for using ANDing inputs A, B, and C as an OR gate (**0 mark**)

Task 5b

The candidate was awarded **1 mark**:

- ◆ $\bar{A} \cdot B \cdot C$ logic gate connections (**1 mark**)
- ◆ $A \cdot \bar{B} \cdot C$ logic gate connections as a NOR rather than an OR was used at the output (**0 mark**)

Task 5c

The candidate was awarded **1 mark**:

- ◆ for valid modification to logic circuit (**1 mark**)
- ◆ the justification statement is unclear (**0 mark**)

Total marks awarded – 23/50

Candidate 3

Task 1a

The candidate was awarded **1 mark**:

- ◆ for selecting a suitable actuator – solenoid (**1 mark**)
- ◆ justification of sensing a train was not mentioned (**0 mark**)

Task 1b

The candidate was awarded **4 marks**:

- ◆ two pipes between the cylinder and 5/2 valve (**1 mark**)
- ◆ not restricting exhaust air in both pipes (**0 mark**)
- ◆ both 3/2 valves connected to the 5/2 valve (**1 mark**)
- ◆ the push button and solenoid actuator on the correct 3/2 valve for the required movement (**1 mark**)
- ◆ the reservoir on the instroke 5/2 valve actuator line (**1 mark**)

Task 2a

The candidate was awarded **4 marks**:

- ◆ for all flowchart stages with the correct symbols (**1 mark**)
- ◆ for flowchart pins, decisions, and time delays (**1 mark**)
- ◆ for selecting all correct circuit components (**1 mark**)
- ◆ the circuit wiring due to battery orientation (**0 mark**)
- ◆ for integration of the flowchart and circuit (**1 mark**)

Task 2b

The candidate was awarded **0 marks** as the pin numbers do not match with task 2a.

Task 2c

The candidate was awarded **4 marks**:

- ◆ the initial test result for task 2a with the motor off and flashing LEDs (**1 mark**)
- ◆ for planned amendment – move diode 180° (**1 mark**)
- ◆ correct retest results from task 2d changes (**1 mark**)
- ◆ in the second initial retest result – nothing happens, as no motor and LED comment is included (**0 mark**)
- ◆ there is a second planned amendment error – loop back from input 7, this should have stated output 7 (**0 mark**)

- ◆ for correct retest results for evidence in 2d (**1 mark**)

Task 2d

The candidate was awarded **2 marks**:

- ◆ for carrying out first planned amendment – move diode 180° (**1 mark**)
- ◆ for completing second planned amendment – looping to start of the flowchart (**1 mark**)

Task 3a(i)

The candidate was awarded **0 marks**:

- ◆ incorrect external input – light sensor (**0 mark**)
- ◆ incorrect external outputs – motor and lamp (**0 mark**)

Task 3a(ii)

The candidate was awarded **3 marks**:

- ◆ for a system boundary and boxes around all the sub-systems (**1 mark**)
- ◆ for motor in an output position (**1 mark**)
- ◆ for lamp in an output position (**1 mark**)
- ◆ just one driver was used for both outputs (**0 mark**)
- ◆ no limit switches were connected to the microcontroller (**0 mark**)
- ◆ the feedback loop does not start after the motor or include a limit switch (**0 mark**)

Task 3b

The candidate was awarded **3 marks**:

- ◆ for the LDR symbol (**1 mark**)
- ◆ for the (variable) resistor symbol (**1 mark**)
- ◆ for wiring the components as a dark sensor (**1 mark**)

Task 3c

The candidate was awarded **1 mark**:

- ◆ the description does not reference any effect on V_{out} the when the light level is reduced (**0 mark**)
- ◆ for an appropriate planned test of the circuit in task 3b – change the resistance of the variable resistor (**1 mark**)

- ◆ the description does not describe any effect on V_{out} of their planned test (**0 mark**)

Task 4a

The candidate was awarded **3 marks**:

- ◆ for justifying not meeting specification point i. by referring to gaps in the gear spacing (**1 mark**)
- ◆ for justifying meeting specification point ii. with reference to the gear direction of rotation (**1 mark**)
- ◆ for justifying not meeting specification point iii. by referring to increasing the output speed (**1 mark**)

Task 4b

The candidate was awarded **2 marks**:

- ◆ the gear train with all gear sizes shown (**1 mark**)
- ◆ for reducing the output speed by 12:1 (**1 mark**)

Task 4c

The candidate was awarded **2 marks**:

- ◆ for simulating the type of gear in task 4b (**1 mark**)
- ◆ for simulation gear sizes all matching 4b (**1 mark**)

Task 4d

The candidate was awarded **2 marks**:

- ◆ for correct input and output speeds from task 4c (**1 mark**)
- ◆ velocity ratio based on given input/output speeds (**1 mark**)

Task 5a

The candidate was awarded **2 marks**:

- ◆ for inverting input B (**1 mark**)
- ◆ for ANDing inputs A, B, and C (**1 mark**)

Task 5b

The candidate was awarded **2 marks**:

- ◆ $\bar{A} \cdot B \cdot C$ logic connections (**1 mark**)
- ◆ $A \cdot \bar{B} \cdot C$ logic connections (**1 mark**)

Task 5c

The candidate was awarded **2 marks**:

- ◆ for adding more inputs (**1 mark**)
- ◆ for valid justification of the modification (**1 mark**)

Total marks awarded – 37/50