Designing a divider input

Core BUILD THE BASICS

C1 A light must come on when it gets dark. **State** the sensor you would use. **[1]**

C2 For C1, **state** whether the LDR should be the top or bottom resistor. **[1]**

C3 A fan must come on when it gets hot. **State** the sensor and its position. **[2]**

C4 **State** the nearest E12 value to 3.5 kΩ. **[1]**

C5 A heater must come on when it gets cold. **State** the sensor and its position. **[1]**

C6 A blind must close when it gets bright. **State** the sensor and its position. **[1]**

C7 V_s = 9 V, switch at 0.7 V. **State** the voltage across the top resistor. **[1]**

Stretch GO FURTHER

S1 Night light: LDR (bottom) is 62 kΩ at 20 lux. V_s = 5.0 V, switch at V_{out} = 0.7 V. **Calculate** R_{var} (top). **[3]**

S2 Hot-sensing: thermistor (top) is 8.0 kΩ at 30 °C. V_s = 9.0 V, switch at 0.7 V. **Calculate** R_{var} (bottom). **[3]**

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S3 For S1, **describe** the expected results in terms of V_{out}. **[2]**

S4 Fan on at 40 °C: V_s = 9 V, thermistor (top) 5.3 kΩ, switch at 0.7 V. Calculate the bottom resistor. **[3]**

S5 Night light: V_s = 5 V, LDR (bottom) 32 kΩ at 50 lux, switch at 0.7 V. Calculate the top resistor. **[3]**

Exam Ready QUALIFICATIONS SCOTLAND STYLE

E1 A ski centre snow cannon must start when the air falls below −2 °C. **Describe** how you would design the sensing sub-system. Refer to the sensor, its position and how the switching point is set. **[3]**

E2 For E1, **describe** the expected results in terms of V_{out}. **[2]**

E3 **Explain** one environmental benefit of only running the snow cannon when it is cold enough. **[2]**

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E4 A frost warning sign (fictional Highland Roads) must flash below 1 °C. **State** the sensor, its position and the expected results in terms of V_{in}. **[4]**

E5 **Explain** why a variable resistor is often used instead of the calculated fixed resistor. **[2]**

Total: 35 marks. Use the Data Booklet. Show your working and give units.