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ASSESSMENT and QUALIFICATIONS ALLIANCE

## General Certificate of Education

# Electronics 1431/2431

## ELEC1 Introductory Electronics

# Mark Scheme

*2009 examination – June series*

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

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*Dr Michael Cresswell Director General*

**1** (a) $D = \overline{A}$ ✓ $E = \overline{\overline{A} \cdot B}$ ✓

Bars are Vital Consequential marking

(b) (i) $Q = \overline{C + E}$ ✓

Bars are Vital Consequential marking

(ii) $Q = \overline{(\overline{A} \cdot B) + C}$ ✓

Bars are Vital Consequential marking

(c) A and C must be logic 0 and B must be logic 1 ✓

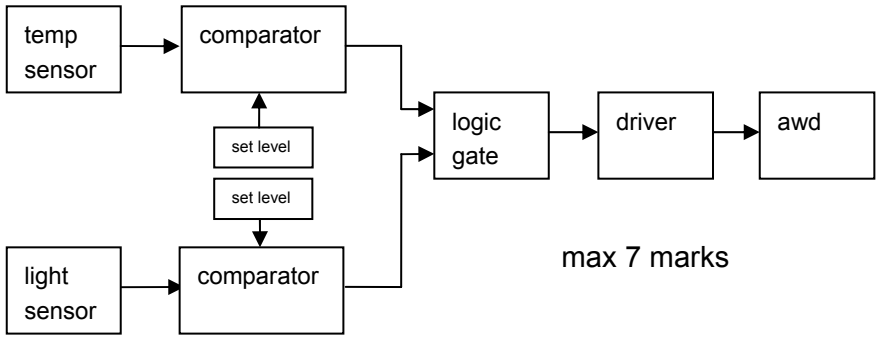
Marking points in bold

(d)

| A | B | C | D | E | Q | |
|---|---|---|---|---|---|---|
| 0 | 0 | 0 | **1** | **1** | **0** | ✓ |
| 0 | 0 | 1 | **1** | **1** | **0** | |
| 0 | 1 | 0 | **1** | **0** | **1** | ✓ |
| 0 | 1 | 1 | **1** | **0** | **0** | ✓ |
| 1 | 0 | 0 | **0** | **1** | **0** | ✓ |
| 1 | 0 | 1 | **0** | **1** | **0** | |
| 1 | 1 | 0 | **0** | **1** | **0** | |
| 1 | 1 | 1 | **0** | **1** | **0** | |

*(11 marks)*

**2** (a)




max 7 marks

One per correct subsystem, comparators plus set level count as one

(b) (i) driver✓

(ii) comparator✓

(iii) temperature sensor✓

(c) (i) 160 − 10 = 150mA✓

(ii) 9V × 160mA✓ = 1.44W✓

Or answer plus correct unit *(13 marks)*

**3** (a) $R_1$ = 2.7kΩ✓
$R_2$ = 6.3kΩ✓

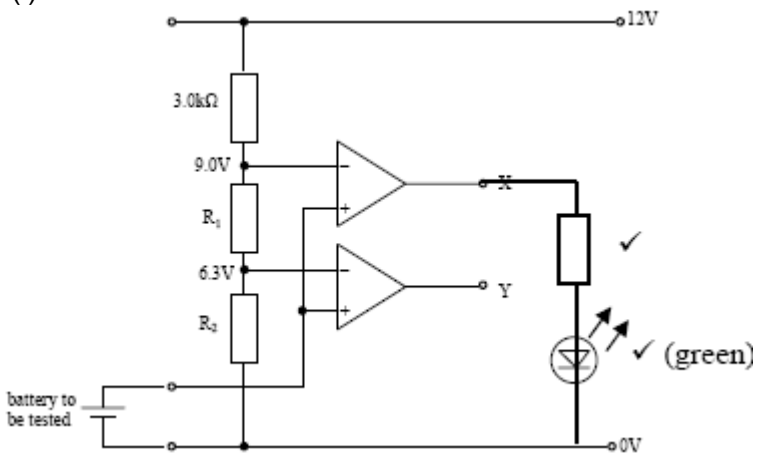
(b) comparator✓

(c)

| voltage of battery to be tested | voltage at X | voltage at Y | |
|---|---|---|---|
| less than 6.3V | 0 | 0 | ✓ |
| between 6.3 and 9.0V | 0 | 12 | ✓ |
| more than 9.0V | 12 | 12 | ✓ |

One mark per correct line

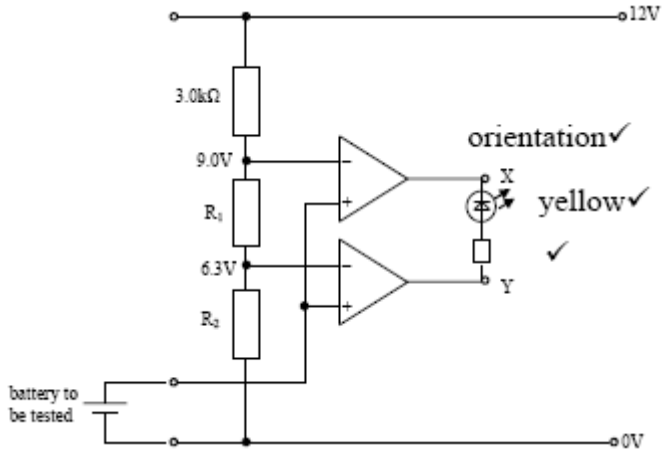
(d) (i)




(ii) To limit LED current ✓

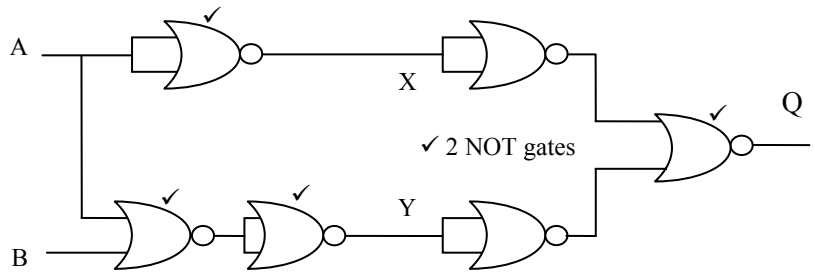
(iii) resistor voltage = 12 − 2 = 10V✓
R = V ÷ I = 10 ÷ 20mA✓ = 500Ω✓ ecf

(e)

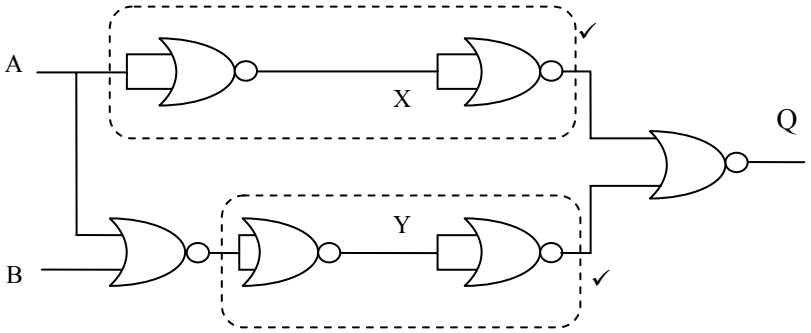



*(15 marks)*

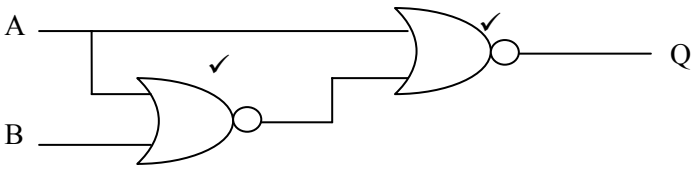
**4** (a)




(b)

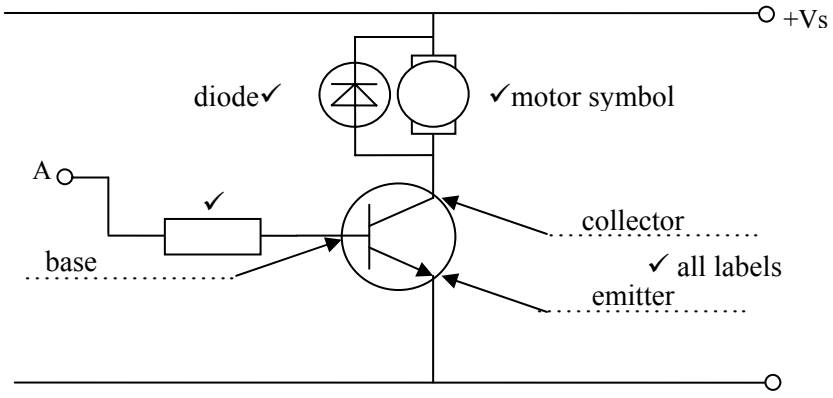



(c) (i)




(ii) Any **two** reasons from: only one type of IC need be stocked, cheaper, simpler, less current/power, less complex✓✓ *(11 marks)*

**5** (a)

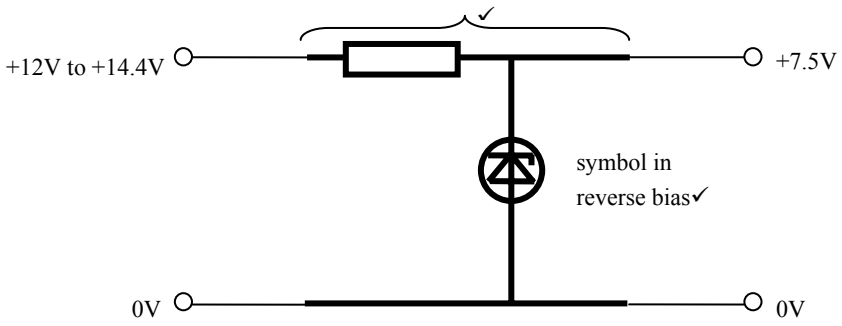



Npn junction transistor ✓

(b) (i) 300 ÷ 60 = 5mA ✓

(ii) V across resistor 5.6 − 0.6 = 5V (or 0.7V)✓
R = 5 ÷ 0.005✓ = 1kΩ✓ ecf *(9 marks)*

**6** (a)




(b) (i) 12 – 7.5 = 4.5V✓

(ii) 100 + 10 = 110mA✓

(iii) 4.5 ÷ 0.11 = 41Ω✓ ecf

(iv) 39Ω✓ ecf

(v) orange white✓black gold✓ ecf *(8 marks)*