GCE MARKING SCHEME

SUMMER 2017

ELECTRONICS - ET2
1142/01

INTRODUCTION

This marking scheme was used by WJEC for the 2017 examination. It was finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conference was held shortly after the paper was taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conference, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about this marking scheme.

GCE ELECTRONICS - ET2

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Question			Answers/Explanatory Notes * **Indicates that ECF will be allowed from a previous part**	Marks Available
1	a		1 kΩ (1)	1
	b		2 kΩ (1)) *	1
	c		Voltage across resistors = 15 - 0.7 = 14.3 V (1) I = 14.3/2 = 7.15 mA (1) *	2
	d		V_1= 7.15 V * [**No ecf** if diode ignored in calculation to part c]	1
	e		V_{OUT} = 15 - 7.15 = 7.85 V *[**No ecf** if diode ignored in calculation to part c] or V_{OUT} = Ans d + 0.7 V	1 **[6]**
2.	a	(i)	Astable/Pulse Generator/Relaxation osc	1
		(ii)	Switch debounce	1
	b	(i)	To prevent false switching e.g. due to changes in ambient light	1
		(ii)	P low Q high [accept 0/1]	1
	c		Use of thermistor and resistor in voltage divider (1) Thermistor at the top (1)	2 **[6]**
3.	a	(i)	Voltage across R_{DC} = 7 V (1) R_{DC} = 350 Ω (1)	3
		(ii)	360 Ω (1) *	
	b	(i)	Diode across LED (1) in inverse parallel (1)	3
		(ii)	R_{AC}: accept range 175 Ω to 180 Ω (1) * [allow **ecf** from (a)]	 **[6]**
4.	a		Correct position of diode Correct position of capacitor Correct position of load	1 1 1
	b	(i)	16 V	1
		(ii)	Correct shape of graph for HWR (1) substantial ripple (1) peaks at 15.3 V (1) *	 3
	c		Increase capacitance [Accept reduce load current/increase load resistance]	 1 **[8]**

5.	a		Zero (accept current up to 100 μA)	1
	b		r_{DSon} = 1.3/10.8 =0.12 Ω	1
	c		P = 1.3 × 10.8 = 14 W (or $10.8^2 \times 0.12$)	1
	d		Clear explanation of benefit of MOSFET use MOSFET because npn transistor cannot provide both high gain and high load current.	2 **[5]**
6.	a		165 s c.a.o.	1
	b		Substitution/multipliers (1) 114 s [accept range 113.8 – 116] (1) *	2
	c		Buzzer stays off for first 114 secs after door is opened (1) Buzzer comes on (for next 66 secs) (1) * Buzzer switches off when door closes (1)	3 **[6]**
7.	a		Appropriate scales (1) Quality of curve (1)	2
	b	(i)	V_Z = 3.9 V (accept range 3.9 – 4 V)	1
		(ii)	I_L = 260 mA (accept range 250 - 270 mA)	1
	c		From table when V_{OUT} = 0; I_L = 400 mA hence V_R = 12 V (1) R = 12 V/400 mA = 30 Ω (1) * Accept any correct reading off graph or table when I_L=300 mA or greater	2 **[6]**
8.	a	(i)	I_B= 1.5 A/500 = 0.003 A = 3 mA Substitution (1) calculation/units (1)	2
		(ii)	Voltage across base resistor = 4.5 V (1) R_B= 4.5 V/3 mA = 1.5 kΩ (1) *	2
	b		When I_B= 3 mA, voltage across 1.1 kΩ resistor = 1.1 kΩ ×3 mA = 3.3 V (1) V_{IN} = 8.6 - 3.3 = 5.3 V (1) This shows that when the base current is 3 mA the input voltage is just sufficient to saturate the transistor (1) [allow **ecf** from (a)]	3
	c		Allow any other appropriate method. Orientation/connections of light sensing sub-system (1) reference voltage sub-system (1) use of variable resistor (1)	3 **[10]**

9.	a	(i)	Substitution/multipliers (1) Mark = 131.6 ms (1)	3
		(ii)	Space = 65.8 ms (1) *	
	b		Correct shape and correct whole number of cycles (1) 2: 1 M/S ratio (1) *	2
	c		Period = 131.6 + 65.8 = 197.4 ms (1) * Frequency = 1/197.4 ms = 5.1 Hz (1) * [or substitution into frequency formula/multipliers (1), correct answer (1)]	2 **[7]**
TOTAL				**60**