AQA

ASSESSMENT and
QUALIFICATIONS
ALLIANCE

General Certificate of Secondary Education

Electronics 3432

Tier H   Higher

Mark Scheme

2007 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.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

1 (a) loudspeaker/siren/buzzer etc✓

(1 mark)

(b) light dependent resistor/LDR/photodiode etc✓

(1 mark)

(c) process/processing (subsystem)/power supply✓

(1 mark)

(d) multimeter✓

(1 mark)

(e) parallel✓, series✓

(1 mark)

(f) byte✓

(1 mark)

(g) address✓

(1 mark)

(h) write/store✓

(1 mark)

(i) frequency✓

(1 mark)

(Total 10 marks)

2 (a) (i) 0.1 (A)✓

(ii) 0.1 × 30 = 3 V✓✓

(iii) $P = I^2R$ / VI / V^2/R = 0.3 W✓✓

(iv) 0.5W✓

(6 marks)

(b) (i) 6 (V)✓

(ii) correct symbol✓, in parallel✓

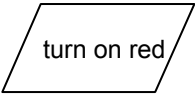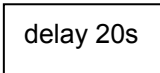*(3 marks)*

(c) orange✓, black✓, black✓, gold✓

(4 marks)
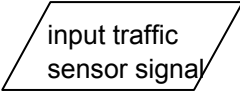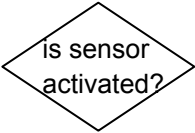
(d) (i) correct symbol✓correct names✓in correct order✓
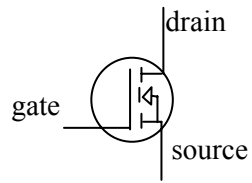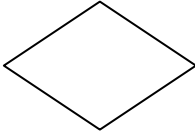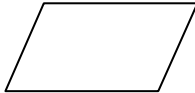
(ii) high input resistance✓ high "gain" (or equivalent)✓

(5 marks)

(Total 18 marks)

3 (a)

start ✓

turn on red ✓

delay 20s ✓

input traffic sensor signal ✓

is sensor activated? ✓

(5 marks)

(b) decision box ✓

input box ✓

a loop - any line that returns to a point earlier in the flow chart ✓

output box ✓

process box ✓

(5 marks)

(c) (i) 23s ✓

(ii) green on for 10s longer ✓

(iii) 2 ✓

(iv) 6s ✓

(v) 56s ✓

(5 marks)

(d)

```
                              ┌──────────────────────┐
                              │   pedestrian symbol  │
                              │         red          │
                              └──────────┬───────────┘
                                         │
                                         ▼
                              ╱──────────────────────╲
                             ╱     input state         ╲        ✓
                             ╲     of button           ╱
                              ╲──────────┬───────────╱
                                         │
                                         ▼
                                  ╱───────────╲
                                 ╱     is       ╲   N
                                 ╲ button pressed? ╱ ──────       ✓
                                  ╲───────────╱
                                         │ Y
                                         ▼
                              ┌──────────────────────┐
                              │      10s delay       │              ✓
                              └──────────┬───────────┘
                                         │
                                         ▼
                             ╱──────────────────────╲
                            ╱  pedestrian symbol      ╲
                            ╲       green             ╱
                             ╲──────────┬───────────╱
                                         │
                                         ▼
                              ┌──────────────────────┐
                              │      15s delay       │      ✓
                              └──────────────────────┘
```
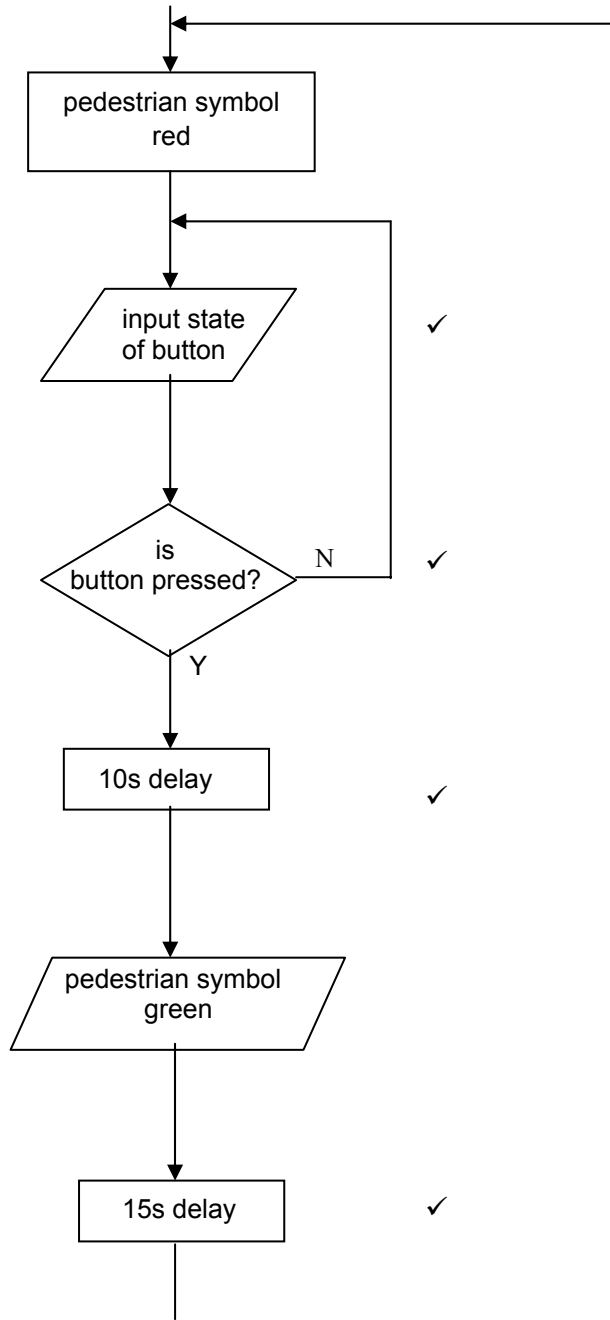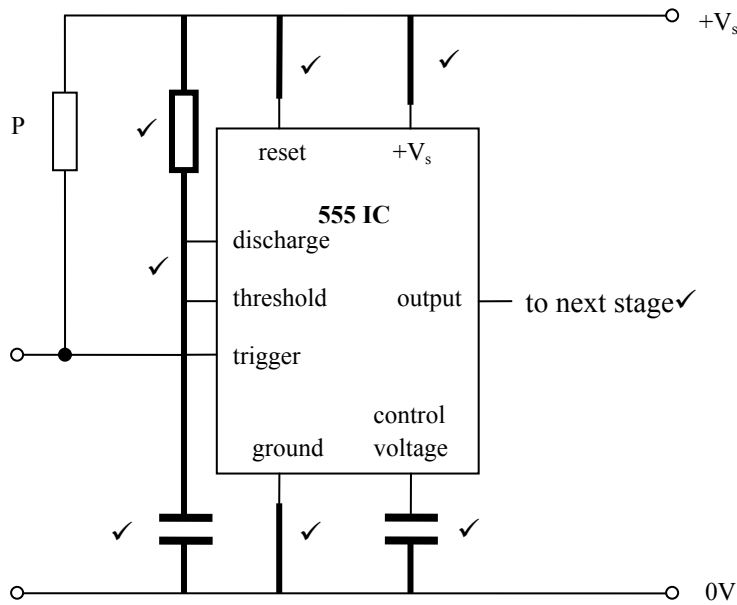
(5 marks)
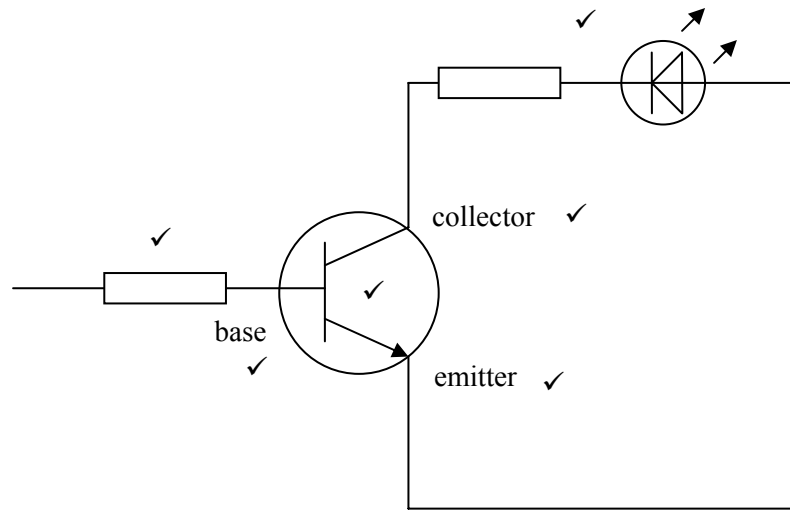
(Total 20 marks)

4   (a)

(8 marks)

(b)   the maximum output current from logic gate or timer
is less than 450 mA (required by LED), or 12V o/p > 4V required✓

(1 mark)

(c)   (i)   8V✓

(ii)   450 mA✓

(iii)   R = V ÷ I = 8 ÷ 0.45✓ = 17.77Ω✓

(iv)   18 Ω   (allow 20 Ω) ✓

(5 marks)

(d)

(6 marks)

(e)
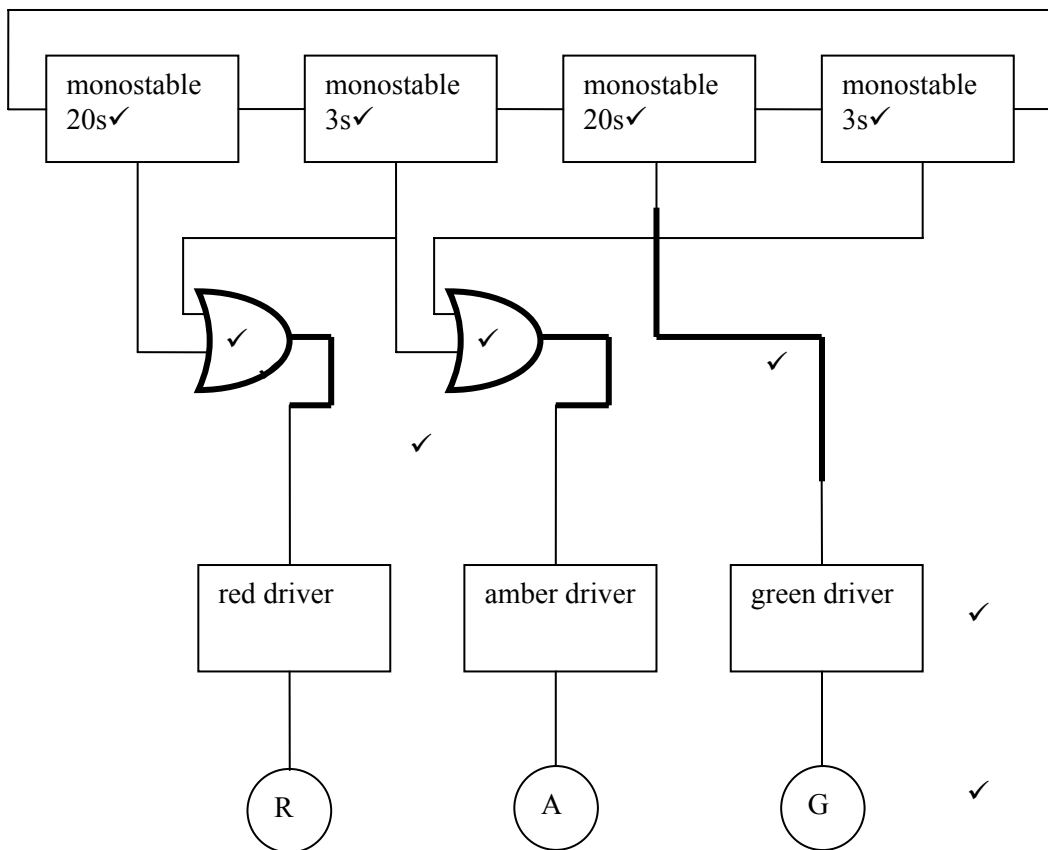
(10 marks)

(Total 30 marks)

5 (a) (i) $3 \times 2 = 6$ V✓✓

(ii) $4 \times 0.5 = 2$ ms/0.002 s✓✓

(iii) $1/0.002 = 500$ Hz/0.5 kHz✓✓

(iv) $6/50 = 0.12$ V✓✓

(8 marks)

(b) (i) range of frequencies✓ for which the gain is at least half the maximum/$V_0 > (V_{max}/\sqrt{2})$✓
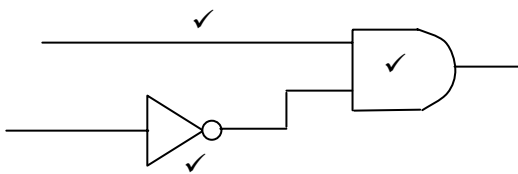
(ii) 25kHz✓

(iii) gain✓ decreases✓

(5 marks)

(c) (i) $V_{RMS} = 6/1.4 = 4.2/4.3$(V)✓

(ii) $V_{RMS}I_{RMS}$ or V_{RMS}^2/R or $V_P^2/2R = 4.4\text{-}4.6$ W✓✓

(4 marks)

(Total 17 marks)

6 (a) (i) e.g.

(ii)

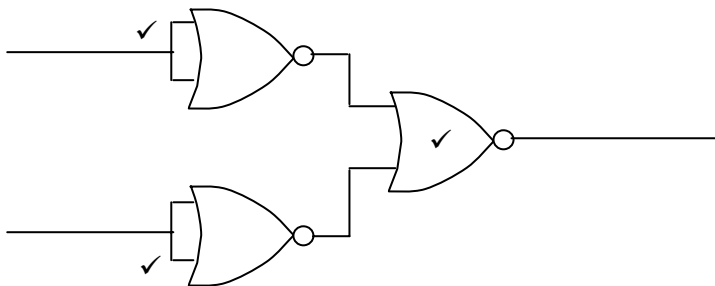|			
		1	0
		1	0
		0	1
		0	0
		✓	✓

(iii)

(8 marks)

(b)   (i)   out put is high if $V_+ > V_-$✓ out put is low if $V_+ < V_-$✓

        (ii) $6 \times (30/50) = 3.6$ V✓✓

        (iii)   ratios or current calc. 10 kΩ✓✓

        (iv)   low/0 V/ ≤2V✓

(7 marks)

(c)   (i)   D to bar Q✓ CK input✓ Q output✓

        (ii)   All bar Qs to D✓ both Qs to clock✓input 1st CK✓ output 3rdQ✓

        (iii)

```
 ⎤ 0010
 ⎬ 0011  ✓
 ⎰ 0100
 ⎱ 0101
 ⎬ 0110  ✓
 ⎰ 0111
```

(9 marks)

(d)   (i)

			1	0	1	0
			1	0	1	0
			1	0	1	0
			1	0	1	0
			1	0	1	0
			1	0	1	0
			0	1	1	0
			0	1	0	1
			✓	✓	✓	✓

        (ii)   safe for car to set off/all safety sensors give 1✓

(5 marks)

(Total 29 marks)

7 (a) $T = (R_1 + 2R_2)C/1.44 = (10 + 2 \times 30) \times 10^3 \times 10 \times 10^{-6}/1.44$
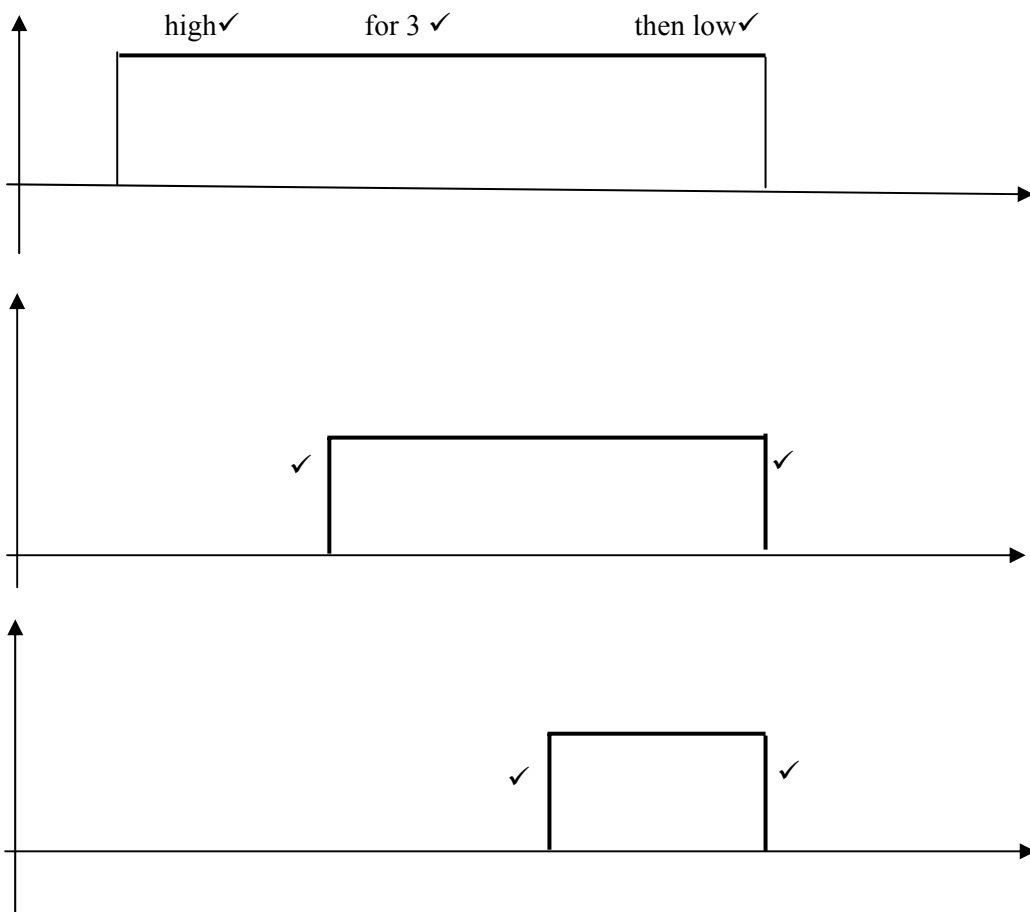
= 0.49 s ✓✓ ✓

(3 marks)

(b) (i) battery wrong way round ✓

(ii) capacitor wrong way round ✓

(iii) resistors wrong way round ✓

(iv) supply to pins 4 and 8 missing ✓

(v) connection to 10 nF missing ✓

(vi) connection to pin 6 missing ✓

(6 marks)

(c) (i) set input goes high✓

(ii) reset input goes high✓

(2 marks)

(d)

high✓   for 3 ✓   then low✓

(7 marks)

(e)   (i)   output goes high✓ and stays high even if input goes low✓

       (ii)   cannot (easily) be reset ✓

(3 marks)

(f)   (i)   0 V✓

       (ii)   pull up resistor/to keep X high when switch is not pressed✓

       (iii)   out put goes high✓ because the AND gate already has one high input✓
when the switch is pressed out put goes low(resets)✓
provided that the input has gone low✓(3 max)

(5 marks)

(Total 26 marks)