

M1.(a) $R = \frac{(15-10)}{110 \times 10^{-3}}$ (1)
 $= 45(.5) \Omega$ (1)

2

(b) (use of $P = I^2R$ gives) $P = (110 \times 10^{-3})^2 \times 45$ (1)
 $= 0.54(5) \text{ W}$ (1)
 (allow C.E. for value of R from (a))

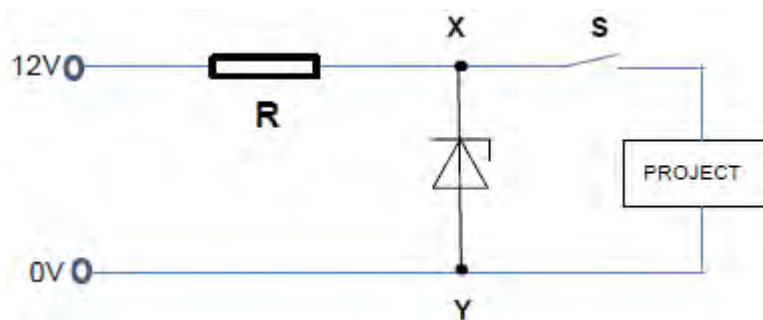
2

(c) 43Ω (1)
 (allow C.E. for value of R from (a))
 go to lower resistor to ensure current through zener is $> 10 \text{ mA}$ (1)

2

[6]

M2.(a)



1 mark for Zener symbol
 1 mark for orientation

2

(b) (i) $80\text{mA} + 5\text{mA} = 85\text{mA}$
Answer - 1

1

(ii) $12\text{V} - 5.1\text{V} = 6.9\text{V}$
Calculation and answer - 1

1

(iii) $R = 6.9V / 85mA = 81\Omega$

Calculation and answer - 2

2

(c) (i) $P = V^2 / RP = (6.9 \times 6.9) / 75P = 0.64W$
Hence P is approx. 0.6W

Calculation and answer - 2

2

(ii) $I = V / R \quad I = 6.9 / 75 \quad I = 92mA$

Calculation and answer - 2

2

[10]

M3.(a) $10mA + 88mA = 98mA\checkmark$; V across resistor = $4.4-2.7 = 1.7V\checkmark$; $R=1.7 / 0.098 \checkmark = 17.3\Omega\checkmark$

4

(b) $98mA\checkmark$

1

(c) $P = I.V = 0.098 \times 2.7\checkmark = 0.265W\checkmark$; use $0.5W\checkmark$

3

(d) Voltage across R will increase \checkmark ,
so current through R will increase. \checkmark
current through zener will increase \checkmark

3

[11]

M4.(a) (i) zener diode \checkmark

1

- (ii) $4.7V ✓$ 1
- (iii) reverse ✓ 1
- (b) (i) $5 + 100 = 105mA ✓$ 1
- (ii) $10 - 4.7 = 5.3V ✓$ 1
- (iii) $5.3 \div 0.105 ✓ = 50.5\Omega ✓$ 2
- (iv) $47\Omega ✓$ 1
- (c) (i) $14.4 - 4.7 = 9.7V ✓$ $9.7 \div 33 = 294mA ✓$ 2
- (ii) $4.7 \times 0.294 = 1.38W ✓$ 1
- [11]**