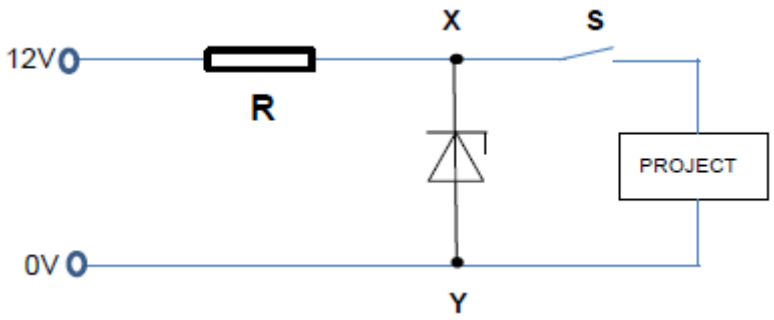
Practice electronics Paper Mark Scheme

**M1.**(a)




1 mark for Zener symbol
1 mark for orientation

**2**

(b) (i) 80mA + 5mA = 85mA
*Answer − 1*

**1**

(ii) 12V − 5.1 V = 6.9V
*Calculation and answer − 1*

**1**

(iii) R = 6.9V / 85mA = 81Ω
*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*

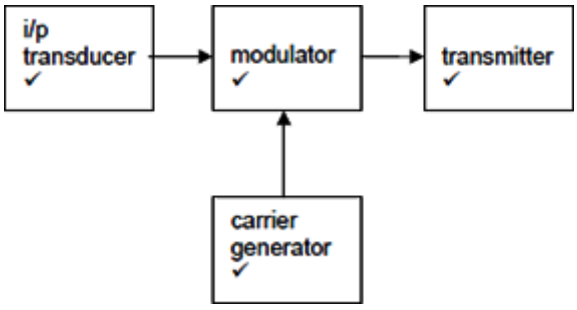
**2**

(ii) I = V / R I = 6.9 / 75 I = 92mA
*Calculation and answer − 2*

**2**

**[10]**

**M2.**(a)




**4**

(b) (i) carrier generator✓

**1**

(ii) use of $f = 1 \div 2\pi\sqrt{LC}$✓

$1 \div 2\pi\sqrt{10^{-7} \times 5 \times 10^{-12}}$ ✓

225 MHz✓

**3**

(c) calc leading to $\lambda$ = 1.32m✓
1.33 ÷ 2 = 0.66m✓

**2**

**[10]**

**M3.**(a) Choice of 20kΩ✓
pot div calculation✓
8V✓

**3**

(b) upper half the value of lower✓
in range 1kΩ to 10kΩ✓
preferred values 1kΩ and 2kΩ, or 1.8kΩ and 3.6kΩ etc✓

**3**

(c) (i) +12V or high✓

**1**

(ii) 0V or low✓

**1**

**[8]**

**M4.**(a) (i) inverting (amplifier) **(1)**

**1**

(b) use of $V_{out} = (-)\frac{R_f}{R_i} \times V_{in}$ **(1)**

$= (-)\frac{120}{30} \times 0.5 = -2.0$ V **(1)**

**2**

(c) (i) $V_{peak\ (input)} = 2.0 \times \sqrt{2} = 2.8(3)$ V **(1)**

(ii) input trace (A): sinusoidal with $T$ = 20 ms **(1)**
and peak = 2.8 V **(1)**

for output voltage, $V_{peak\ (out)} = (-)\frac{120}{30} \times 2.8(3) = (\pm)11.3$ (V) **(1)**

(allow C.E. for value of $V_{peak\ (input)}$ from (i)

trace B: inversion w.r.t. trace A **(1)**
same period as trace A **(1)**
flat region (saturates) at ± 5 V **(1)**

**max 6**

**[9]**

**M5.**(a) D = C + B

*1*

E = $\overline{A}$

*1*

G = $\overline{A+B}$

*1*

**3**

(b)

| INPUTS | | | INTERMEDIATE OUTPUTS | | |
|---|---|---|---|---|---|
| **C** | **B** | **A** | **D** | **E** | **G** |
| 0 | 0 | 0 | **0** | **1** | **1** |
| 0 | 0 | 1 | **0** | **0** | **0** |
| 0 | 1 | 0 | **1** | **1** | **0** |
| 0 | 1 | 1 | **1** | **0** | **0** |
| 1 | 0 | 0 | **1** | **1** | **1** |
| 1 | 0 | 1 | **1** | **0** | **0** |
| 1 | 1 | 0 | **1** | **1** | **0** |
| 1 | 1 | 1 | **1** | **0** | **0** |

*2 marks for each of correct columns D & G*
*1 mark for column E*

**5**

**(Total 8 marks)**