Name of the Student:_____
Max. Marks : 21 Marks **Time : 21 Minutes**

Mark Schemes

Q1.

(a)

Number shown on die	Logic inputs			Logic outputs						
	C	B	A	L1	L2	L3	L4	L5	L6	L7
1	0	0	0	0	0	0	0	0	0	1
2	0	0	1	1	0	0	0	0	1	0
3	0	1	0	1	0	0	0	0	1	1
4	0	1	1	1	0	1	1	0	1	0
5	1	0	0	1	0	1	1	0	1	1
6	1	0	1	1	1	1	1	1	1	0
Reset 6 → 1										

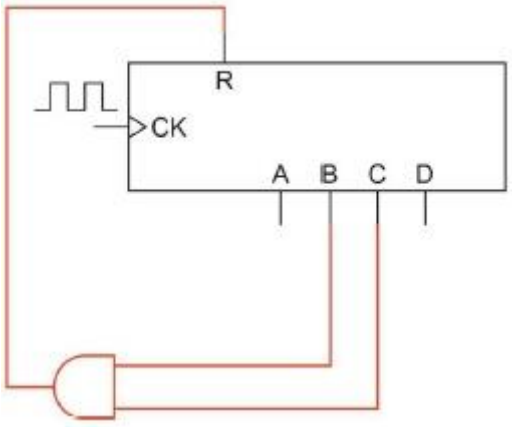
*One mark for each full pattern of **L1** and **L6:***

2

(b) **L7 = NOT A;** Accept: L7 = $\overline{A}$

1

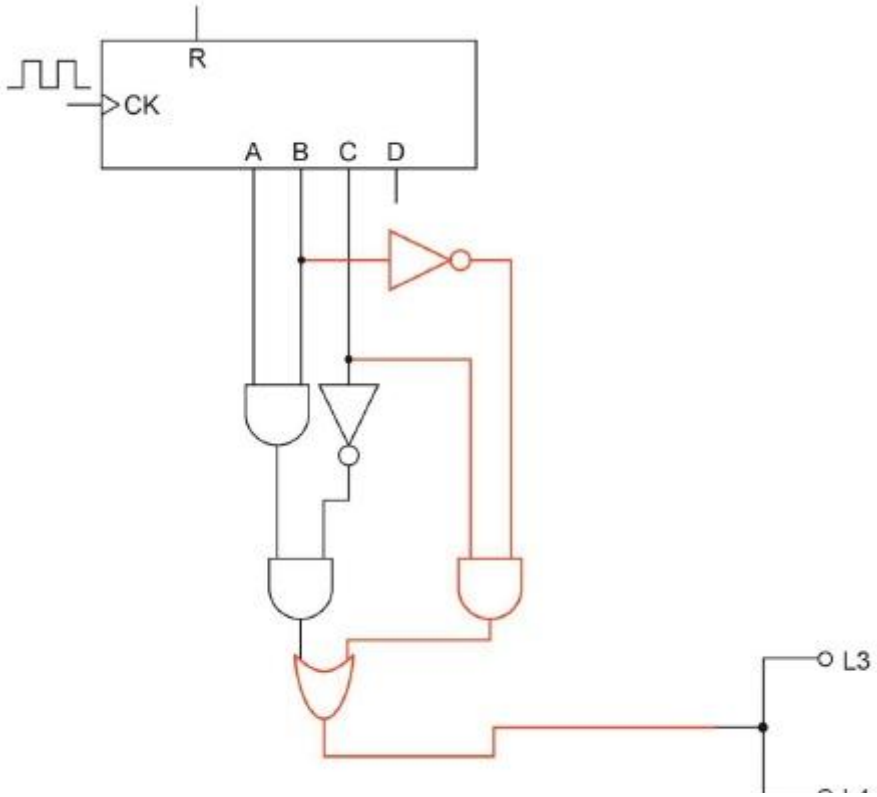
(c)



1 mark for reset condition from B and C
1 mark for use of a single 2-input AND gate
(accept correct implementation of the full reset code $\overline{A}$.B.C for 1 mark)

2

(d)



1 mark - NOT gate from B:

1 mark - AND gate from $\overline{B}$ and C:

1 mark - OR gate connecting the two conditions:

3

[8]

Q2.

(a) $f = 1 / (2\pi \sqrt{LC})$

$C = 1/ f^2 4\pi^2 L$

$C = 1/ (910 \times 10^3)^2 \times 4 \times \pi^2 \times 1.1 \times 10^{-3}$

$C = 27.8$ pF (accept 28pF)

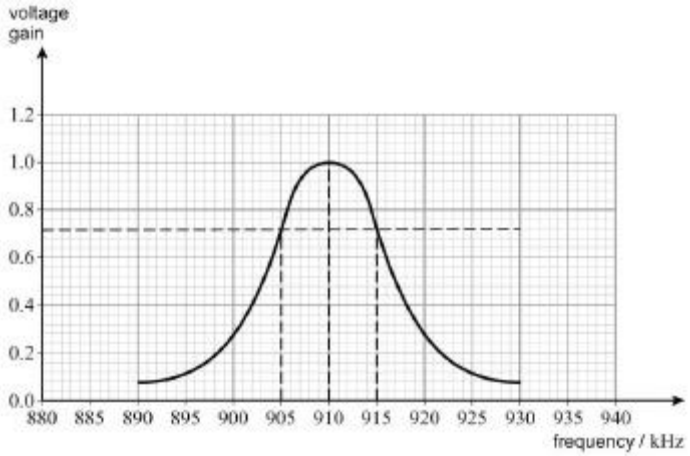
Formula with correct substitution / evidence of correct working

Answer

1

1

(b)



General shape around f_0 and to max of 1.0 on relative voltage gain axis

1

10 kHz bandwidth

at 0.71 gain

1

Frequencies (905 – 910 – 915) kHz (identified / used)

1

(c) Smaller Q factor leads to:

(Any **two** from)
(i) Broader bandwidth
(ii) More noise / (hiss) detected
(iii) Less selectivity
(iv) More susceptible to crosstalk from neighbouring stations on the frequency spectrum.
(v) Less gain due to energy loss / loss of signal detail

2

[7]

Q3.

(a) Period T (= 11.3 − 3.2) = 8.1 ± 0.2 ms.✔

Number of revolutions per second $\left(=\frac{1}{T}=\frac{1}{8.1\times10^{-3}}\right)$ = 120 (± 10) (rev s^{-1}).✔

2

(b) Signal is noisy **OR** output is not at appropriate levels for logic circuit.✔

1

(c) $V_A\left(=\frac{12}{12+8.2}\times5\right)=(+)2.97\,V$ ✔

1

(d) Output pd switches between 0 and +5V.✔
Output pd is inverted compared to input pd.✔
Waveform has vertical sides cutting curve at about 3V.✔

MAX 2

[6]