

# Paper Solution

Subject: LIC

Branch: ETC

First Half 2022

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Q.1

(Supplementary)

- a) 5 points of comparison  
Each point carries 1 mark.

b) Given:

$$V_1 = 2V$$

$$V_2 = 4V$$

$$V_3 = 5V$$

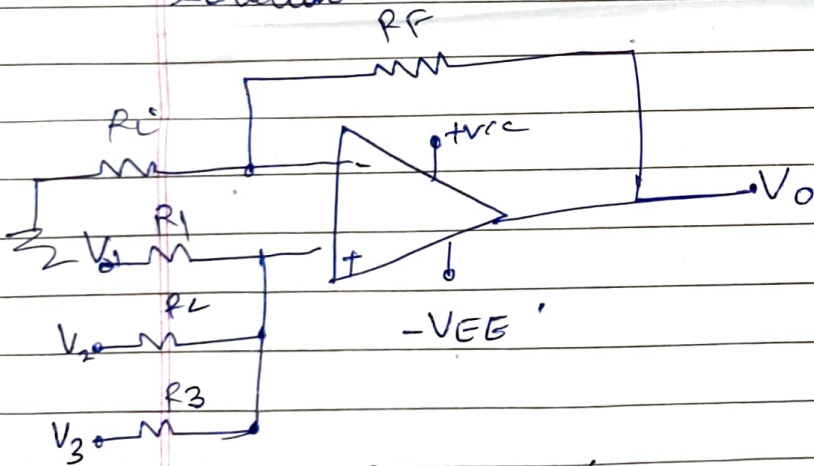
$$R_F = 2K\Omega$$

$$R_1 = R_2 = R_3 = R = 1K\Omega$$

To find:

$V_0$

Solution:



$$V_0 = \left(1 + \frac{R_F}{R_i}\right) \left(\frac{V_1 + V_2 + V_3}{3}\right)$$

(Since  $R_1 = R_2 = R_3 = R = 1K\Omega$ )

$$V_0 = \left(1 + \frac{2 \times 10^3}{R_i}\right) \left(\frac{11}{3}\right)$$

value of  $R_i$  can be assumed

c) diagram  $\rightarrow$  2 marks.

explanation  $\rightarrow$  2 marks

waveform  $\rightarrow$  1 mark.

d) Block diagram  $\rightarrow$  2 marks.

explanation  $\rightarrow$  3 marks.

Q.2a) <sup>Circuit</sup> diagram  $\rightarrow$  2 marks  
 explanation  $\rightarrow$  2 marks.

b) Circuit diagram  $\rightarrow$  2 marks.  
 Explanation  $\rightarrow$  2 marks.

c) diagram of RC Phase shift Oscillator (2 marks)

Explanation (2 marks)

Adv & Dis Adv (2 marks)

d) Given:

$$f = 1\text{kHz}$$

$$D = 60\%$$

$$C = 0.1\mu\text{F}$$

$$D = 0.6$$

$$0.6 = \frac{R_A + R_B}{R_A + 2R_B}$$

$$(R_A + 2R_B) 0.6 = R_A + R_B$$

$$0.6R_A + 1.2R_B = R_A + R_B$$

$$0.2R_B = 0.4R_A$$

$$\boxed{R_B = 2R_A}$$

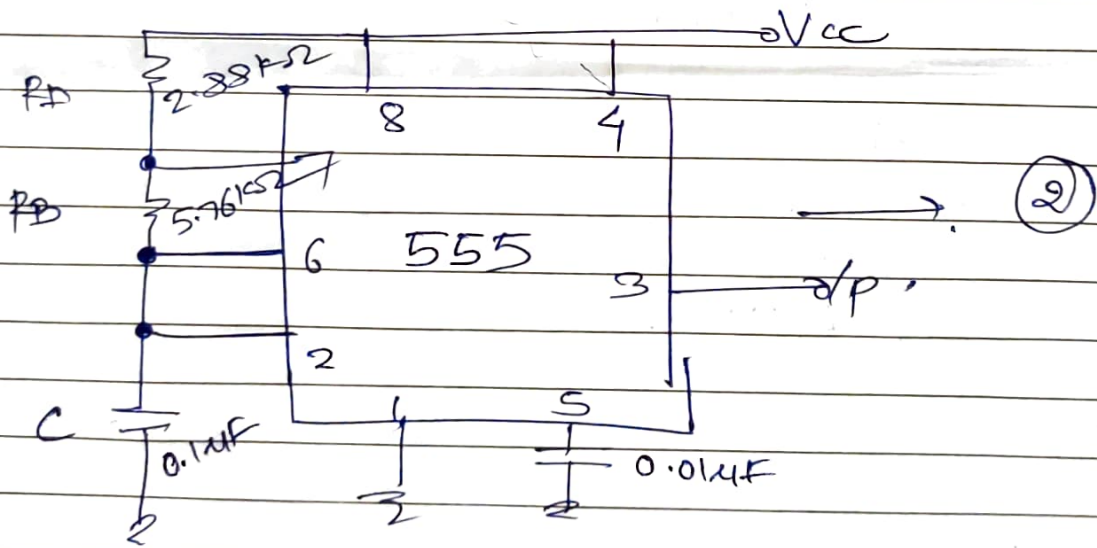
$$f = \frac{1.44}{(R_A + 2R_B) \cdot C}$$

Assume  $C = 0.1 \mu F$

$$1 \times 10^3 = \frac{1.44}{(R_A + 2(2R_A)) \times 0.1 \times 10^{-6}} \longrightarrow (2)$$

$$1 \times 10^3 = \frac{1.44}{5R_A \times 0.1 \times 10^{-6}}$$

$\therefore R_A = 2.88 \text{ k}\Omega$   
 But  $R_B = 2R_A = 5.76 \text{ k}\Omega$



Q.2  
 a) 4 points of comparison  
 each point carries 1 mark

b) diagram (2 marks)  
 explanation (2 marks)

c) diagram of R/2R ladder (2marks)

Explanation (4marks)

d)  $V_0 = 9V$   
 $I_0 = 3A$   
 $R_2 = 10K\Omega$

① It is high voltage high current Regulator

②  $V_0 = \left(1 + \frac{R_1}{R_2}\right) \times V_{ref}$

$9 = \left(1 + \frac{R_1}{10 \times 10^3}\right) \times 7$

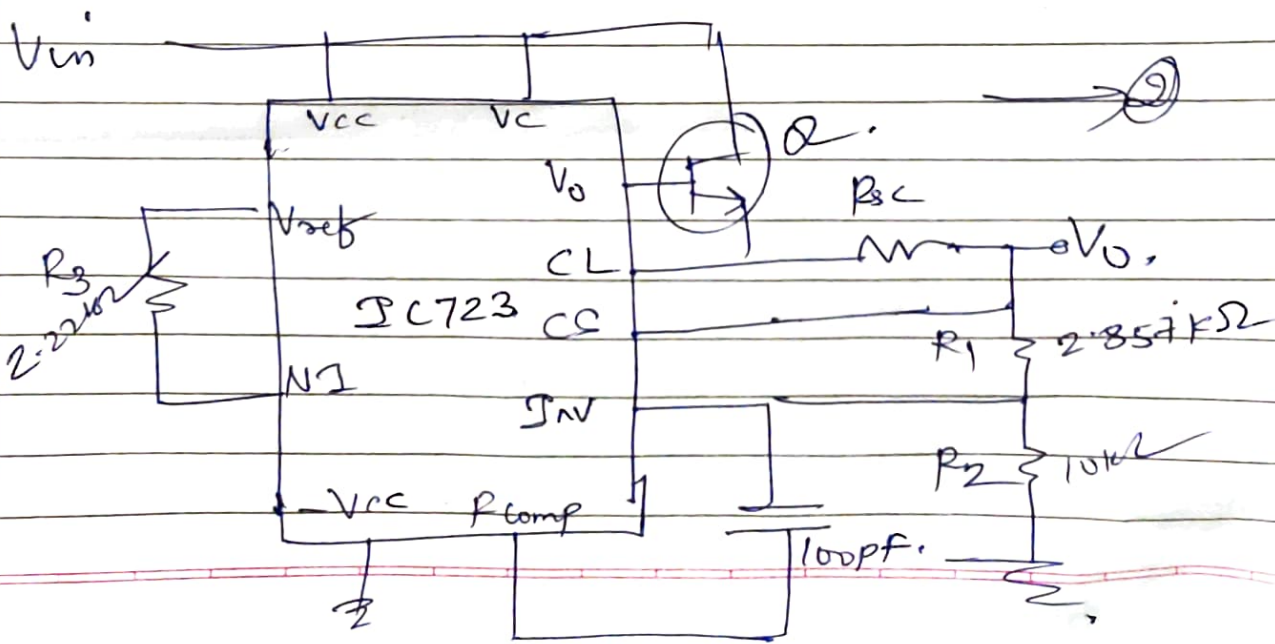
→ (4)

$\therefore R_1 = 2.857K\Omega$

③  $R_{sc} = \frac{0.6}{I_{limit}} = \frac{0.6}{3} = 0.2\Omega$

④  $R_3 = R_1 \parallel R_2 = 2.22K\Omega$

⑤  $\beta = \frac{I_L}{I_{Lmax \text{ of } IC723}} = \frac{3}{150mA} = 20$



04  
a)diagram of window detector  $\rightarrow$  (2M)Explanation  $\rightarrow$  (2M)b) 4 performance parameters <sup>explanation:</sup> & each parameter carries 1 mark.

c) Circuit diagram of Instrumentation Amplifier (2M)

Explanation with O/p voltage expression (4M)

d) block diagram (2M)  
explanation (4M)