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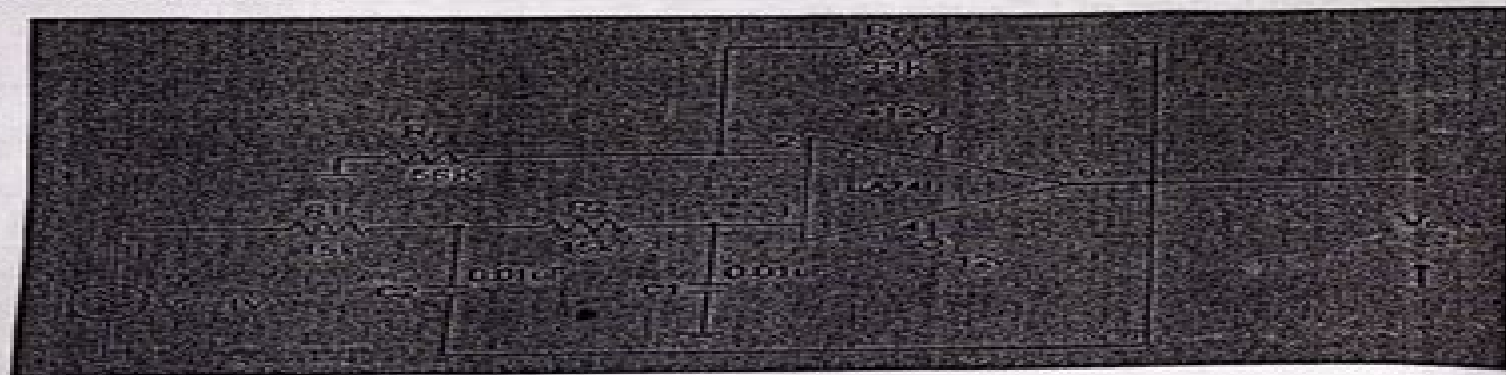
SECOND ORDER ACTIVE FILTERS

A. LOW PASS FILTER:

AIM: To design a second order Low pass Butterworth filter for a cutoff frequency of 1 K and to draw its frequency response. Calculate there from the cut-off frequency and Roll-factor.

APPARATUS REQUIRED: Op-amp ($\mu A741$), Resistors $33K\Omega$, $56K\Omega$, $15K\Omega$ 2 nos Ceramic (Disk) Capacitors $0.01\mu F$ 2nos, Power supply, Signal generator, CRO Connect wires etc.

CIRCUIT DIAGRAM:



$$f_c = \frac{1}{2\pi CR} \text{ and } K = 1.5858$$

DESIGN:

Gain: $K = (1 + R_f / R_1) = 1.5858$; Cut-off Frequency: $f_c = 1 / (2\pi CR)$

Given $f_c = 1 \text{ KHz}$; Let $C_1 = C_2 = C = 0.01\mu F$

Then $R_1 = R_2 = R = 1 / (2\pi f_c C) = 1 / (2\pi \times 1K \times 0.01\mu F) = 15.9 \text{ K}\Omega$ (Remember $1/2 \pi = 0.159$)

Use $R_1 = R_2 = R = (12 + 3.9K\Omega)$ Series combination

The pass band voltage gain, $K = 1.5858 \Rightarrow R_f / R_1 = 0.5858$ or $R_f = 0.5858 R_1$

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