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17/ENG02/012

COMPUTER ENGINEERING

A. Discuss the benefits of filters in engineering system.

1. Filters are used in Radio tuning to a specific frequency.
2. Filters are electronic circuits that remove any unwanted components or features from a signal such as Noise, Interference and Distortion from the input signal.
3. Filters are economical or cost-effective
4. An active filter has Flexibility in Gain and Frequency Adjustment
5. Active Filter Circuits require power supply
6. Electronic systems such as fluorescent lighting, computers, printers, etc. generate harmonics. These devices are also known as nonlinear loads. The major issues associated with the supply of harmonics to nonlinear loads are severe overheating. The installation of a harmonic filter to each nonlinear load connected to the power system reduces over heating in the engineering systems.

B. Design a low pass filter of 0.005Ω and $0.01F$ using **building blocks only**;

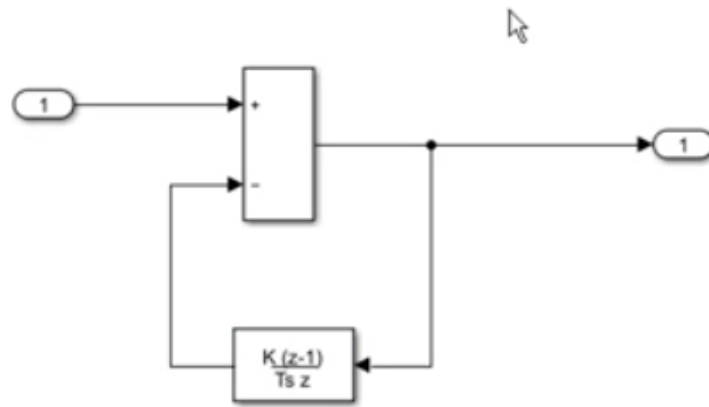
Derivation of formula for low pass filter

$$v_{in}(t) - v_{out}(t) = R i(t)$$

$$Q_c(t) = C v_{out}(t)$$

$$i(t) = \frac{dQ_c}{dt}$$

$$v_{in}(t) - v_{out}(t) = RC \frac{dv_{out}}{dt}$$



Low pass filter

C. Determine the cut-off frequency

Cut off frequency formula = $\frac{1}{2} * (\pi R * C)$

R= 0.005 C = 0.01F

Cut off frequency = $0.005 * 0.001 = 3189.099\text{Hz}$

D. Simulate the design and show the output using a display unit

