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17/ENG06/008

MECHANICAL ENGINEERING

ENG 342 ASSIGNMENT

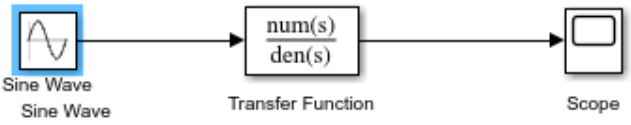
QUESTION A.

- FILTERS AUTHORIZES RADIO RECEIVERS TO ONLY "SEE" THE DESIRED SIGNAL WHILE REJECTING ALL OTHER SIGNALS (ASSUMING THE OTHER SIGNALS HAVE DIFFERENT FREQUENCY CONTENT).
- FILTERS ARE USED TO ELIMINATE UNDESIRED HIGH FREQUENCIES (I.E., NOISE) THAT ARE PRESENT ON AC INPUT LINES. ADDITIONALLY, FILTERS ARE USED ON A POWER SUPPLY'S OUTPUT TO REDUCE RIPPLE.
- A CROSSOVER NETWORK IS A NETWORK OF FILTERS USED TO CHANNEL LOW-FREQUENCY AUDIO TO WOOFERS, MID-RANGE FREQUENCIES TO MIDRANGE SPEAKERS, AND HIGH-FREQUENCY SOUNDS TO TWEETERS.
- USED IN AUDIO APPLICATIONS FOR EQUALIZATION PURPOSES.
- USED IN RECEIVERS SUCH AS SUPERHETERODYNE ETC FOR EFFICIENT RECEPTION OF THE BASEBAND SIGNALS.

QUESTION B.

DESIGNING A LOW-PASS FILTER WITH 0.005Ω RESISTOR AND 0.01F CAPACITOR

A 100V AMPLITUDE WAS SELECTED WITH A FREQUENCY OF 1HZ FOR THE SINE WAVE SOURCE.



QUESTION C.

DETERMINING THE CUT-OFF FREQUENCY

THE CUT-OFF FREQUENCY IS CALCULATED BY F= ½*(PI*R*C)

WHEN R= 0.005Ω AND C= 0.01F

F= 0.5*PI*0.005*0.01=3189.099 HZ

QUESTION D.

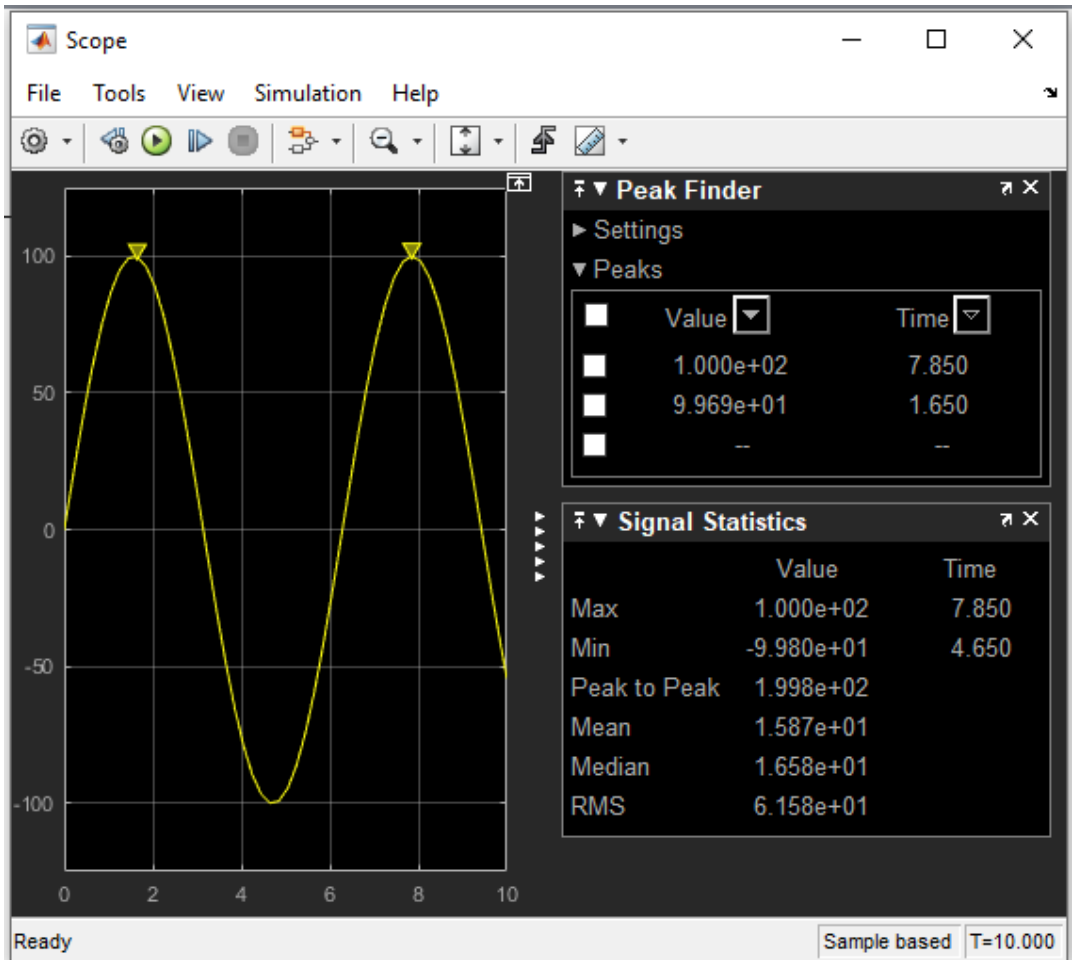
DESIGN OUTPUT

THE TRANSFER FUNCTION EQUATION FOR THE CIRCUIT IS GIVEN AS

(1/RC)/(S + 1/RC)

WHEN R= 0.005Ω AND C= 0.01F

TRANSFER FCN=(1/0.005*0.01)/(S + (0.005*0.01))= (20000)/(S+ 20000)



A. **IF TWO SIGNALS OF 5 KΩ AND 2 KΩ ARE PASS THROUGH THE FILTER AT DIFFERENT INTERVALS. DISCUSS YOUR OBSERVATION**

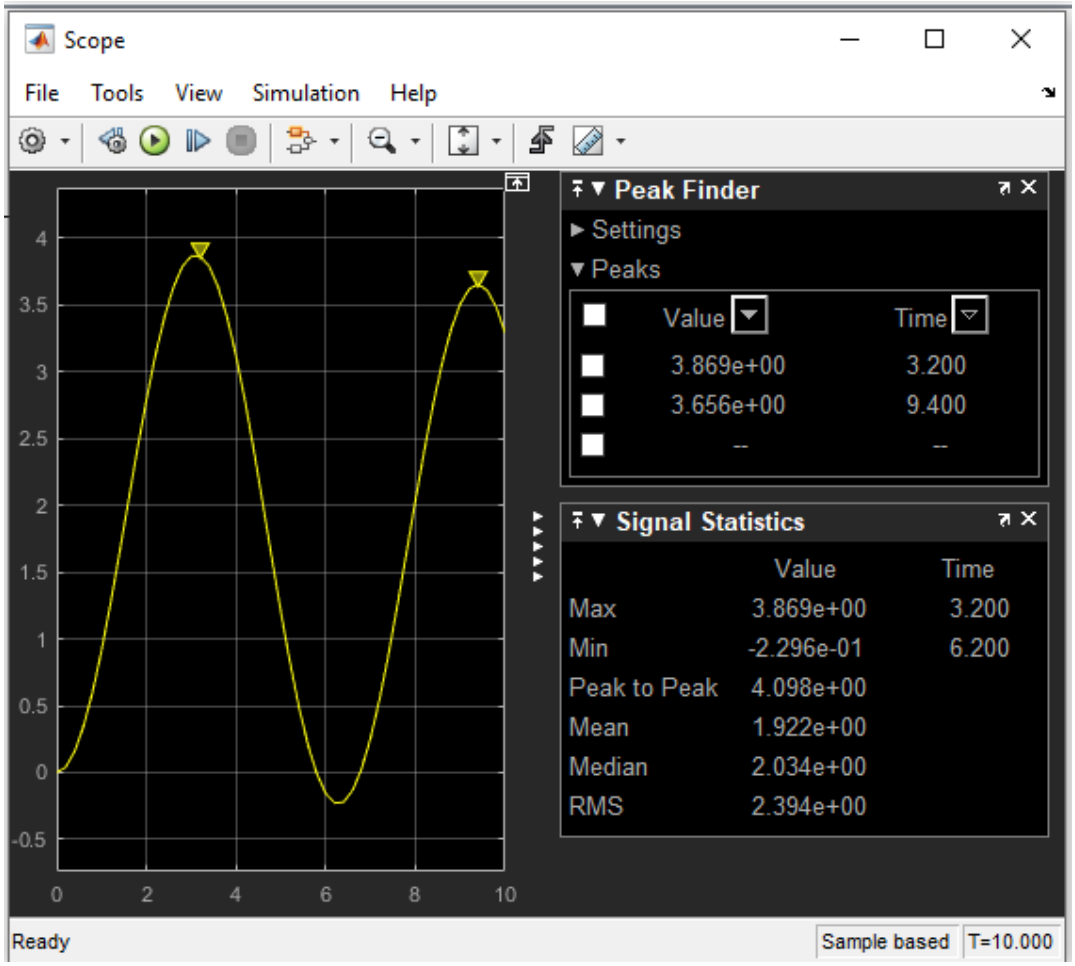
WHEN THE SIGNAL OF 5 KΩ IS PASSED THROUGH THE FILTER, THE FOLLOWING RESULT IS OBTAINED:

THE TRANSFER FUNCTION EQUATION FOR THE CIRCUIT IS GIVEN AS

(1/RC)/(S + 1/RC)

WHEN R= 5000Ω AND C= 0.01F

TRANSFER FCN=(1/5000*0.01)/(S + (5000*0.01))= (0.02)/(S+ 0.02)



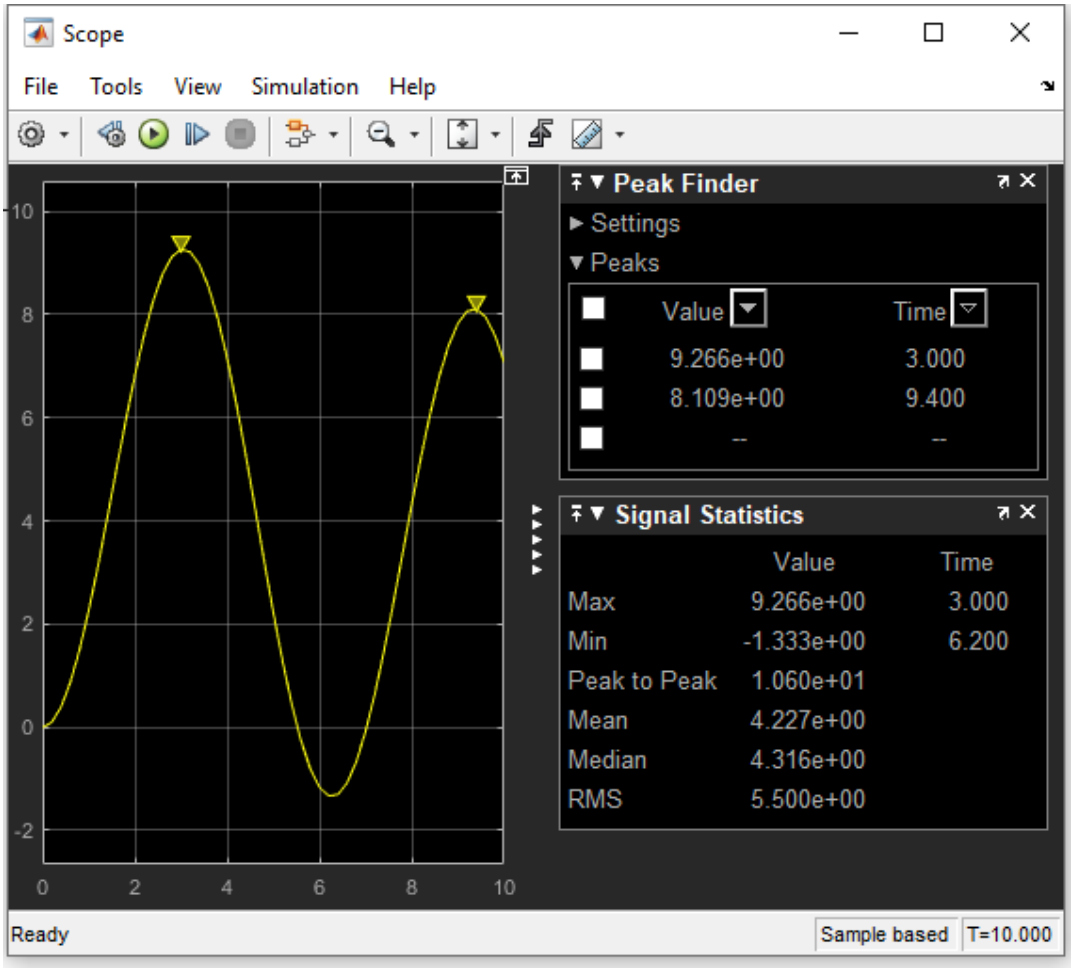
OBSERVATIONS: THE SIGNAL IS ATTENUATED TO 3.869 OHMS

WHEN THE SIGNAL OF 2K OHMS IS PASSED THROUGH THE FILTER THE FOLLOWING RESULTS ARE OBTAINED: THE TRANSFER FUNCTION EQUATION FOR THE CIRCUIT IS GIVEN AS

(1/RC)/(S + 1/RC)

WHEN R= 2000Ω AND C= 0.01F

TRANSFER FCN=(1/2000*0.01)/(S + (2000*0.01))= (0.05)/(S+ 0.05)



OBSERVATIONS: THE SIGNAL IS ATTENUATED TO 9.266 OHMS