**THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE**
**DEPARTMENT OF ELECTRICAL & ELECTRONIC ENGINEERING**

**Faculty of Engineering and Technology**

**FOURTH YEAR /SUPPLEMENTARY SEMESTER EXAMINATIONS**
**FOR THE DEGREE OF SCIENCE IN ELECTRICAL & ELECTRONIC ENGINEERING**

**EEE 2405 ANALOGUE FILTERS**

**MAY 2011 SERIES** **TIME: 2 HOURS**

**INSTRUCTION TO CANDIDATES**

**Answer question ONE and any other TWO questions from the FIVE presented**

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Qu. 1(a) (i) Relate the concept of a transfer function to the operation of a filter

(ii) Describe any TWO major functions of filters in RF systems (4 marks)

(b) Figure Q1(b) shows the circuit of a simple notch filter.

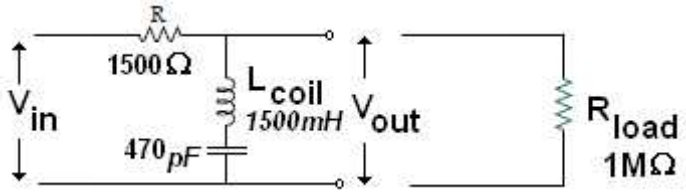


Fig. Qu.(1b)

Determine the following:

I. The transfer function H(w) for the loaded and unloaded output
II. The resonant frequency
III. The circuit magnification (Q)
IV. The circuit bandwidth
V. Upper and lower cut-off frequency (16 marks)

Qu. 2(a) With the aid of well labeled sketches illustrate the pass and stop bands for the following filter responses

(i) Low pass
(ii) High pass
(iii) Band pass
(iv) Notch (8 marks)

(b) Describe how filters are used in the following applications:

(i) Power supplies

(ii) Receivers

(iii) Transmitters

(v) Audio electronics (4 marks)

(c) (i) Distinguish between passive and active filters indicating their ranges of operation in frequency.

(ii) List any TWO challenges posed by cascading filter sections (6 marks)

(d) Given a transfer function H(s), explain the important information that can be extracted from the following:

(i) No. of poles

(ii) Coefficient of H(s) (2 marks)

Qu.3 (a) With the aid of a sketch compare the essential characteristics of the following filters types:

i. Butterworth

ii. Chebyshev

iii. Bessel (6 marks)

(b) Consider an RLC low pass filter shown in figure Q3(b).

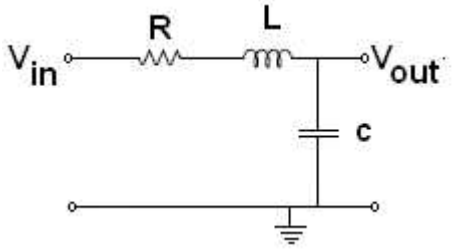


Fig. Qu.(3b)

(i) Determine the transfer functions H(s)

(ii) Express the transfer function in (b)(i) in terms of $\mu_0$ and Q.

(iii) Solving for the denominator of the transfer function H(s) in b(ii) analyze the circuits behaviour when:

a) Q = 0.5

b) Q > 0.5 (14 marks)

Qu.4. Design a passive wide band filter according to the data indicated in figure Q4(i) and table Q(4).

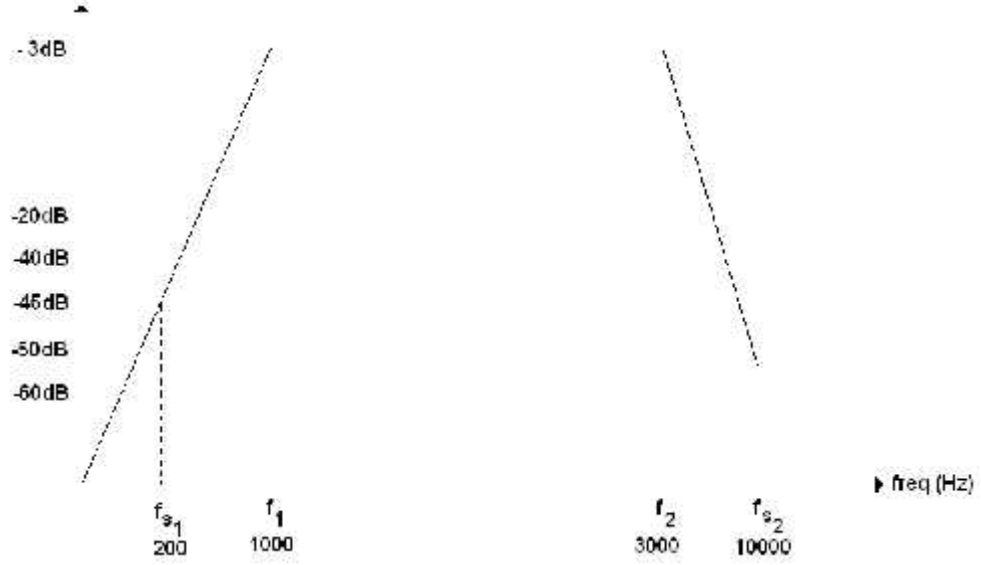


Fig. Qu.4(i)

Assume that the source and load impedances are both 50Ω and a Butterworth design is desired.

Qu.5 (a) (i) Describe any THREE desirable characteristics of active filters.

(ii) Highlight ONE major drawback of active filters (4 marks)

(b) Using the data in figure Q4(ii) and table Q(5) design a Butterworth low-pass active filter with the following specifications:

- 3 dB point at 100 Hz
- 60 dB attenuation at 400 Hz
- Z value of 10,000 Ω (14 marks)

(c) Explain the effect of circuit Q on the transient response of the filter output.

(7 marks)