TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

UNIVERSITY EXAMINATION FOR:

BACHELOR OF SCIENCE IN ELECTRICAL AND ELECTRONIC ENGINEERING

EEE 2303 CIRCUIT AND NETWORK THEORY III

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: September 2018

TIME: 2 HOURS

DATE: September 2018

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **FIVE** questions. Attempt **Question ONE and ANY other TWO questions.**

Do not write on the question paper.

Question ONE

(a) Consider Fig. Qu.1(a). Determine signal value at A, B, and C in mW and dBm (6 marks)

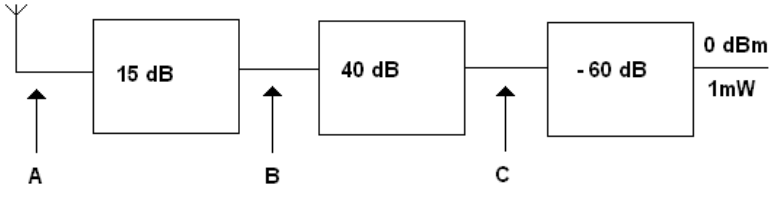


Fig. Qu.1(a)

(b) For the circuit in Fig. Qu. 1(b) determine the following:

(i) The transfer function

(ii) The cut-off frequency

(iii) Sketch the attenuation and phase response

(iv) Analyze circuit behaviour (16 marks)

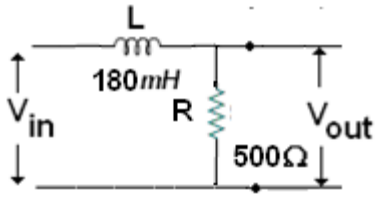


Fig. Qu.1(b)

(c) (i) With respect to filter performance describe the term delay distortion

(ii) How are the three filter types (Butterworth, Chebyshev and Bessel) affected by delay distortion

(iii) In view of the above, identify the filter type that is the most optimal choice for signal reproduction circuits (8 marks)

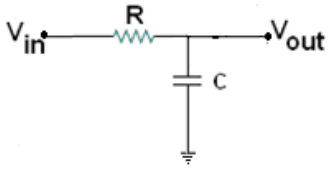
Question TWO

(a) (i) Illustrate the effects of a low input impedance load on a system citing a typical example.

(ii) Explain how the effects in a(i) can be minimized? (5 marks)

(b) (i) Using a pole-zero diagram explain the effect on system stability on placement of poles on either side of the s-plane.

(ii) Describe the effect of Q on the transient response of a second order transfer function. (11 marks)



$$H(\omega) = \frac{1}{1+j\omega CR}$$

Fig. Qu.2(a)

Question THREE

(a) With reference to transfer function analysis describe the following signal conditions:

(i) Transient responses (ii) Phase shift problems (iii) Signal degradation (6 marks)

(b) For the circuit in Fig. Qu.3(b) determine the transfer function $H(s) = \frac{V_{out}}{V_{in}}$ (14 marks)

$H(s) = \frac{V_o}{V_i}(s)$

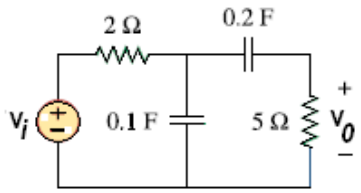


Fig. Qu.3(b)

Question FOUR

(a) Design a Low-pass filter with the following specifications:

$f_{-3dB} = 3000\ Hz$; Attenuation = $-25dB$ at $9000\ Hz$

Assume the filter is connected to source and load impedances of $50\ \Omega$ and that a Butterworth response is desired. Carefully explain all your steps motivating any assumptions made. (20 marks)

Question FIVE

(a) (i) State the general form of the transfer function $H(s)$.

(ii) Explain the significance of the powers in the numerator and denominator of $H(s)$ and how they affect the transfer function response (6 marks)

(b) Obtain the bode plot of the system given by the transfer function (14 marks)

$$G(s) = \frac{4}{s^2+s+4}$$