Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2016/2017

COURSE NAME	:	TRANSFORM CIRCUIT ANALYSIS
COURSE CODE	:	BEF 22803
PROGRAMME	:	BEV
EXAMINATION DATE	:	DECEMBER 2016 / JANUARY 2017
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

TERBUKA

THIS QUESTION PAPER CONSISTS OF **SEVEN (7)** PAGES

Q1 (a) Sketch the waveforms of the following functions:

(i) $x_1(t) = u(t)$

(2 marks)

(ii) $h_1(t) = u(t) - 2u(t-1) + u(t-2)$

(3 marks)

(iii) $h_2(t) = u(t+1) - u(t-1)$

(3 marks)

(b) Determine and draw the piecewise function of signal:

(i) $y_1(t) = x_1(t) * h_1(t)$ where $x_1(t)$ the results from **Q1(a)(i)**, and $h_1(t)$ the results from **Q1(a)(ii)**

(6 marks)

(ii) $y_2(t) = x_1(t) * h_2(t)$ where $x_1(t)$ and $h_2(t)$ are graphs in **Figure Q1(b)(ii)** when T = 2. Unit of t is in second (s).

(6 marks)

Show each steps of the convolution clearly and solve the problem by folding of $x_1(t)$.

Q2 (a) Determine the voltage, $v_o(t)$ of the circuit for $t \geq 0$ shown in **Figure Q2(a)** where $v_C(0^-) = 1V$, $i_L(0^-) = 2V$, and $v_{in}(t) = u(t)$. Use the Laplace transformation to analyse the circuit in frequency (s) domain.

(6 marks)

(b) Find the voltage $v_c(t)$ and $v_L(t)$ of the circuit as shown in **Figure Q2(b)**, suppose $i_{in} = \delta(t)$, $i_L(0^-) = 1V$, and $v_C(0^-) = 1V$. Use Laplace transformation to analyse the circuit in frequency (s) domain.

(14 marks)

Q3 (a) Determine the transfer function of Vo(s)/Vs(s) of the circuit given in **Figure Q3(a)**.

(3 marks)

(b) The transfer function of a linear system, H(s) is given below. Find the output $v_o(t)$ if the input or supply of the system is $e^{-t}u(t)$.

$$H(s) = \frac{V_o(s)}{V_s(s)} = \frac{60}{(s^2 + 4s - 12)}$$

(7 marks)

(c) A transfer function of a system, G(s) is given below. Without using logarithmic graph paper, draw a complete graph of:

(i) the magnitude plot,

(5 marks)

(ii) the phase plot.

(5 marks)

$$G(s) = \frac{10000(s+1)}{(s+10)(s+1000)}$$

Q4 (a) Sketch an example of odd symmetry signal.

(3 marks)

(b) Sketch an example of half-wave symmetry signal.

(3 marks)

(c) Determine the first three terms of the Fourier series of the waveform in **Figure Q4(c)**.

(14 marks)

Q5 (a) Determine and draw the amplitude and phase spectra for the first three terms of the Fourier series below:

$$v(t) = 5 + \frac{20}{\pi} \sum_{n=1(odd)}^{\infty} \frac{sin(2nt)}{n} \; V$$

(6 marks)

(b) Determine the steady-state voltage $v_o(t)$ of the circuit in **Figure Q5(b)** if the input voltage is given by:

$$v_i(t) = 7.5\cos(2t - 122^o) + 2.2\cos(6t - 102^o)$$
$$+1.3\cos(10t - 97^o) + 0.91\cos(14t - 95^o) + \cdots \; V$$

Show your answer for the first four terms of the output voltage, $v_o(t)$.

(14 marks)

-END OF QUESTIONS-

FINAL EXAMINATION

SEMESTER/SESSION : SEMESTER I/ SESSION 2016/2017		PROGRAMME : BEV
COURSE NAME : TRANSFORM CIRCUIT ANALYSIS		COURSE CODE : BEF 22803

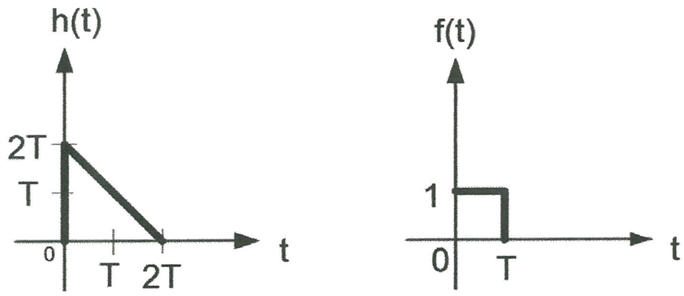

FIGURE Q1 (b) (ii)

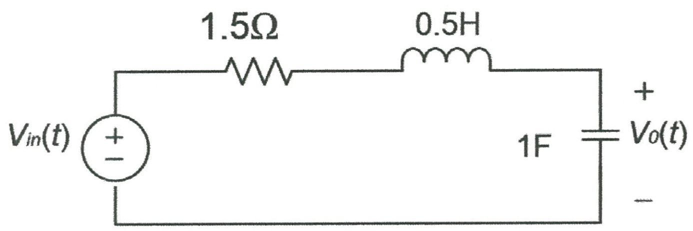

FIGURE Q2 (a)

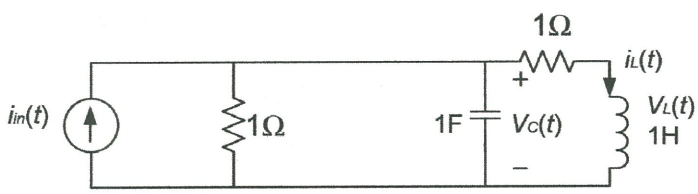

FIGURE Q2 (b)

FINAL EXAMINATION

SEMESTER/SESSION : SEMESTER I/ SESSION 2016/2017 PROGRAMME : BEV
COURSE NAME : TRANSFORM CIRCUIT ANALYSIS COURSE CODE : BEF 22803

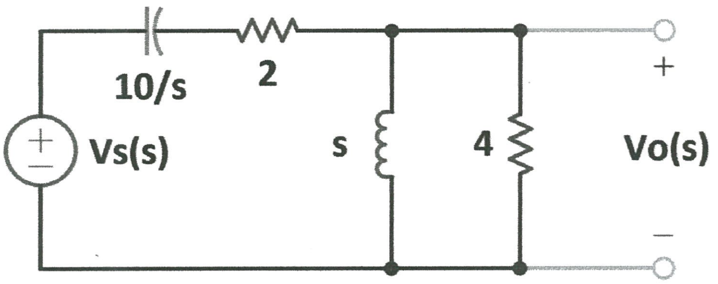

FIGURE Q3 (a)

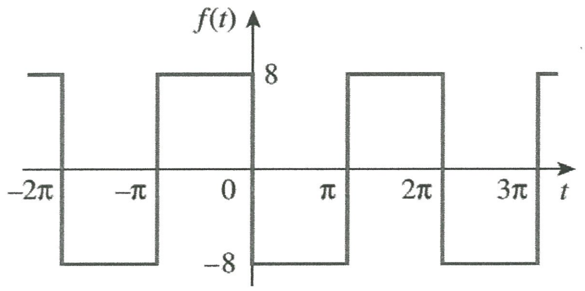

FIGURE Q4 (c)

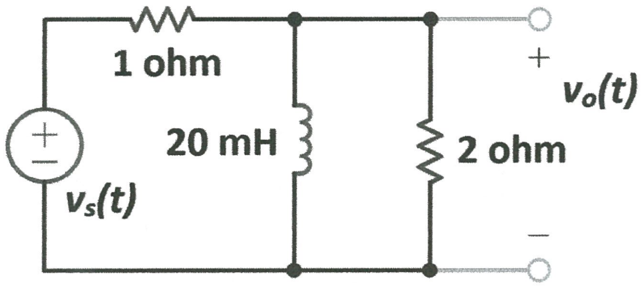

FIGURE Q5 (b)

FINAL EXAMINATION

SEMESTER/SESSION : SEMESTER I/ SESSION 2016/2017 PROGRAMME : BEV
COURSE NAME : TRANSFORM CIRCUIT ANALYSIS COURSE CODE : BEF 22803

$$f(t) = a_0 + \sum_{n=1}^{\infty} (a_n \cos n\omega_0 t + b_n \sin n\omega_0 t)$$

$$f(t) = a_0 + \sum_{n=1}^{\infty} A_n \cos(n\omega_0 t + \phi_n)$$

$$A_n = \sqrt{a_n^2 + b_n^2}, \qquad \phi_n = -\tan^{-1} \frac{b_n}{a_n}$$

$$A_n \underline{/\phi_n} = a_n - jb_n$$

TERBUKA

FINAL EXAMINATION

SEMESTER/SESSION : SEMESTER I/ SESSION 2016/2017
COURSE NAME : TRANSFORM CIRCUIT ANALYSIS
PROGRAMME : BEV
COURSE CODE : BEF 22803

TABLE 1: LAPLACE TRANSFORM TABLE

	$f(t)$	$F(s)$	
1	$\delta(t)$	1	
2	1	$\frac{1}{s}$	$s > 0$
3	t	$\frac{1}{s^2}$	$s > 0$
4	t^n, n=1,2,…	$\frac{n!}{s^{n+1}}$	$s > 0$
5	e^{at}	$\frac{1}{s-a}$	$s > a$
6	te^{-at}	$\frac{1}{(s-a)^2}$	
7	$\frac{t^n e^{-at}}{n!}$	$\frac{1}{(s-a)^{n+1}}$	
8	$\sin at$	$\frac{a}{s^2+a^2}$	$s > 0$
9	$\cos at$	$\frac{s}{s^2+a^2}$	$s > 0$
10	$e^{at}\sin bt$	$\frac{b}{(s-a)^2+b^2}$	$s > a$
11	$e^{at}\cos bt$	$\frac{s-a}{(s-a)^2+b^2}$	$s > a$
12	$y'(t)$	$sY(s)-y(0)$, and $Y(s)=L\{y(t)\}$	
13	$y''(t)$	$s^2Y(s)-sy(0)-y'(0)$	
14	$e^{at}f(t)$	$F(s-a)$	
15	$t^n f(t)$, n=1,2,...	$(-1)^n \frac{d^n}{ds^n}F(s)$	
16	$f(t)u(t-a)$	$e^{-as}L\{f(t+a)\}$	