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UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2018/2019

COURSE NAME	:	TRANSFORM CIRCUIT ANALYSIS
COURSE CODE	:	BEF 22803
PROGRAMME CODE	:	BEV
EXAMINATION DATE	:	DECEMBER 2018/ JANUARY 2019
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

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

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Q1 (a) Determine the Laplace transformation of the following function by referring to the Laplace Transform table provided in **Table Q1(a)**.

(i) $a(t) = 3e^{7t}u(t)$

(2 marks)

(ii) $b(t) = 5cos\ 3tu(t)$

(2 marks)

(iii) $c(t) = 8u(t-4) - 8u(t-8)$

(4 marks)

(iv) $d(t) = \cos 9(t-4)u(t-4)$

(4 marks)

(b) The input circuit of the circuit in **Figure Q1(b)** is $i_s(t) = 5e^{-t}u(t)mA$ with R = 10 kΩ and C= 50 μF. Draw the s-domain equivalent circuit and determine the output voltage in both s domain and time domain.

(9 marks)

(c) If the value of R and C in **Figure Q1(b)** are changed to R = 50 kΩ and C= 10 μF, determine the new output voltage in both s domain and time domain.

(4 marks)

Q2 (a) **Figure Q2(a)** shows the time domain and frequency domain of RC circuit.

(i) Express the transfer function V_o/V_s for frequency domain RC circuit.

(5 Marks)

(ii) Sketch the amplitude and the phase response of the results in **Q2(a)(i).**

(4 Marks)

(b) A new system with a transfer function is cascaded to the existing system to get the new transfer function as below:

$$H_{new}(s) = \frac{500s}{(s+5)(s+10)}$$

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(i) Analyse its characteristics by illustrating its amplitude responses in Bode plot.

(10 Marks)

(ii) Analyse the phase responses in Bode plot.

(6 Marks)

Q3 (a) Obtain the Fourier series expansion of the rectified sine wave shown in **Figure Q3(a).**

(10 marks)

(b) Obtain the Fourier Series of the waveform shown in **Figure Q3(b)** by using exponential form of Fourier Series.

(10 marks)

(c) As an electrical engineer, define the definition of the Fourier series and list **2 (TWO)** advantages of using Fourier Series in circuit analysis.

(5 marks)

Q4 (a) Determine the response $i_o(t)$ in the circuit shown in **Figure Q4(a)** if the input voltage has the Fourier series expansion

$$v(t) = 1 + \sum_{n=1}^{\infty} \frac{2^n}{1+n^2}(\cos nt - n \sin nt)$$

(15 marks)

(b) From **Figure Q4(a),** calculate the total average power dissipated at 4Ω resistor

(10 marks)

-END OF QUESTIONS-

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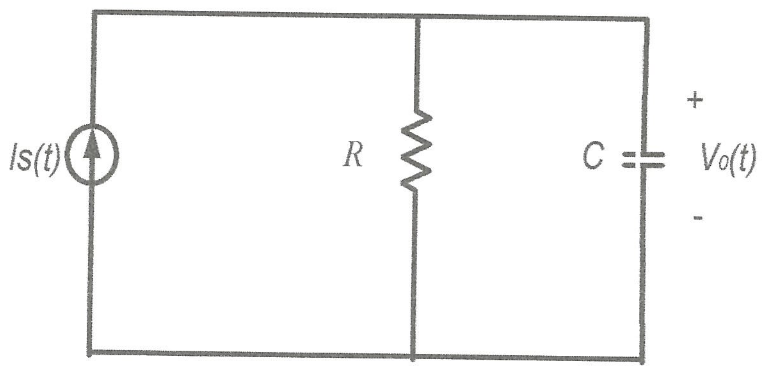

Figure Q1(b)

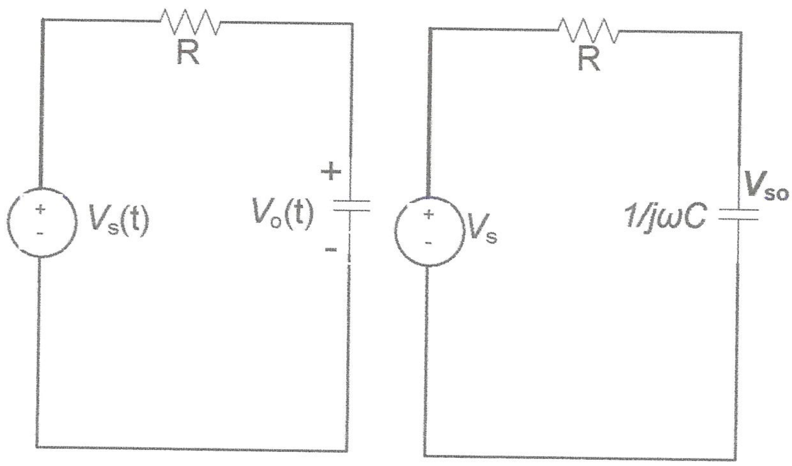

Figure Q2(a)

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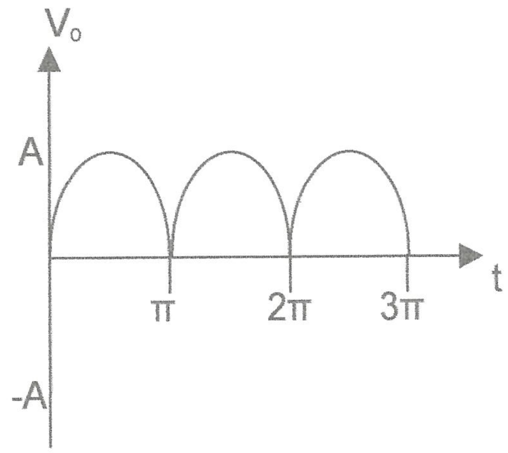

Figure Q3(a)

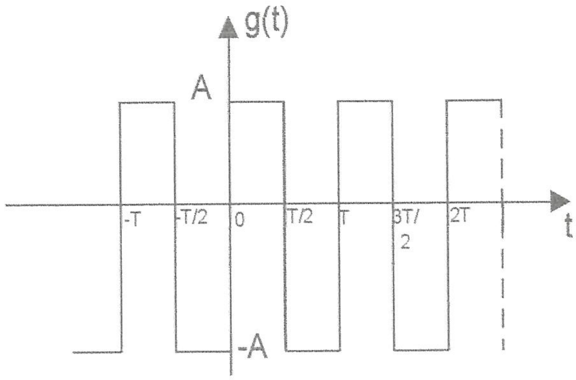

Figure Q3(b)

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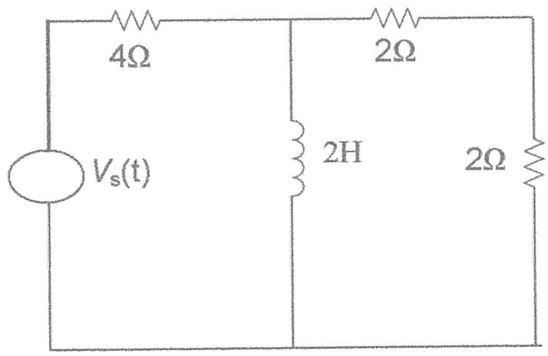

Figure Q4(a)

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TABLE : 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	$f(t)u(t-a)$	$e^{-as}L\{f(t+a)\}$	

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