UNIVERSITI SAINS MALAYSIA

Peperiksaan Semester Pertama
Sidang Akademik 2004/2005

Oktober 2004

EEE 105 – TEORI LITAR I

Masa : 3 jam

ARAHAN KEPADA CALON:

Sila pastikan bahawa kertas peperiksaan ini mengandungi **TUJUH (7)** muka surat beserta Lampiran (3 mukasurat) bercetak dan **ENAM (6)** soalan sebelum anda memulakan peperiksaan ini.

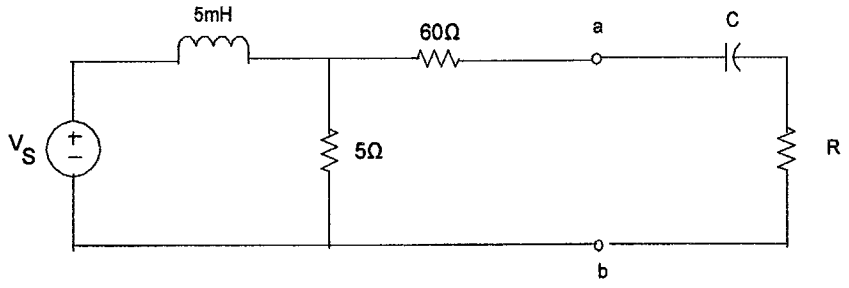
Jawab **LIMA (5)** soalan.

Agihan markah bagi soalan diberikan disudut sebelah kanan soalan berkenaan.

Jawab semua soalan di dalam Bahasa Malaysia.

...2/-

1.



Rajah 1
Figure 1

Merujuk kepada litar dalam Rajah 1.
In reference to the circuit in Figure 1.

(a) Cari kuasa purata maksimum yang boleh dibekal kepada terminal a-b apabila $v_S = 100\cos 80t$.
Find the maximum average power that can be supplied across the terminal a-b when $v_S = 100\cos 80t$.

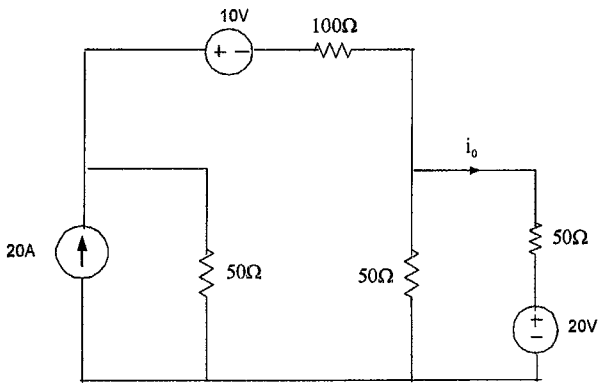
(70%)

(b) Tentukan nilai R dan C yang akan mengeluarkan kuasa maximum dari punca litar.
Specify the values of R and C that will extract the maximum power from the source of the circuit.

(30%)

2. (a) Gunakan prinsip superposisi untuk menentukan i_0 bagi litar dalam Rajah 2(a)
Use the superposition principle to determine i_0 in the circuit in Figure 2(a).

(50%)



Rajah 2(a)
Figure 2(a)

(b) Perintang bolehubah R_L dalam litar Rajah 2(b) dilaraskan hingga kuasa maximum dibekalkan kepada R_L.

The variable resistor R_L in the circuit in Figure 2(b) is adjusted until maximum power is delivered to R_L.

(i) Apakah nilai R_L apabila ini berlaku?
What is the value of R_L when this happens?

(ii) Kira kuasa maximum yang boleh dibekalkan kepada R_L.
Calculate the maximum power that can be delivered to R_L.

(50%)

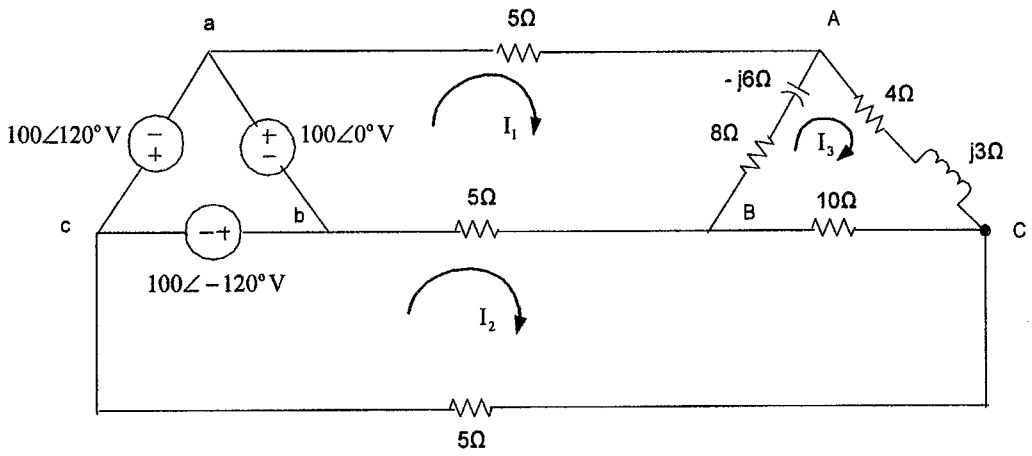
4. Pertimbangkan sistem yang ditunjukkan dalam Rajah 4.
Consider the system as shown in Figure 4.

(a) Kira nilai arus mesh I_1, I_2 dan I_3.
Calculate the mesh currents I_1, I_2 and I_3.

(70%)

(b) Kira jumlah kuasa yang diserap oleh perintang 4 Ω, 8 Ω dan 10 Ω.
Calculate the total power absorbed by the 4 Ω, 8 Ω and 10 Ω resistors.

(30%)



Rajah 4
Figure 4

5. Suis S dalam litar Rajah 5 berada pada **a** bagi satu jangkamasa yang lama sebelum berada pada **b** pada t = 0.
*The switch S in circuit of Figure 5 has been at **a** for a long time before switching to **b** at t = 0.*

(a) Tentukan pemalar masa untuk t > 0.
Determine the time constant for t > 0. (10%)

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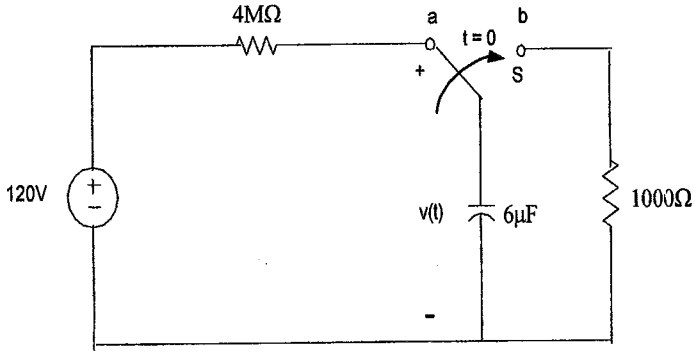
(b) Tentukan v(t) bagi $t \geq 0$.
Determine v(t) for $t \geq 0$. (25%)

(c) Suis akan kembali kepada **a** apabila v(t) = 30V. Berapa lamakah suis akan berada di **b** sebelum kembali ke **a**.
*The switch will return to **a** when v(t) = 30V. How long will the swithch be at **b** before returning to **a**.*
(15%)

(d) Sekiranya suis akan bertukar ke **b** semula apabila v(t) = 75 V, berapa lamakah pula suis akan berada di **a**.
*If the switch will return to **b** when v(t) = 75V, how long will the switch be at **a**.*
(50%)



Rajah 5
Figure 5

Mathematical Formulas

This appendix—by no means exhaustive—serves as a handy reference. It does contain all the formulas needed to solve circuit problems in this book.

C.1 Quadratic Formula

The roots of the quadratic equation $ax^2 + bx + c = 0$ are

$$x_1, x_2 = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

C.2 Trigonometric Identities

$$\sin(-x) = -\sin x$$
$$\cos(-x) = \cos x$$
$$\sec x = \frac{1}{\cos x}, \qquad \csc x = \frac{1}{\sin x}$$
$$\tan x = \frac{\sin x}{\cos x}, \qquad \cot x = \frac{1}{\tan x}$$
$$\sin(x \pm 90°) = \pm \cos x$$
$$\cos(x \pm 90°) = \mp \sin x$$
$$\sin(x \pm 180°) = -\sin x$$
$$\cos(x \pm 180°) = -\cos x$$
$$\cos^2 x + \sin^2 x = 1$$

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \qquad \text{(law of sines)}$$
$$a^2 = b^2 + c^2 - 2bc \cos A \qquad \text{(law of cosines)}$$
$$\frac{\tan \frac{1}{2}(A - B)}{\tan \frac{1}{2}(A + B)} = \frac{a - b}{a + b} \qquad \text{(law of tangents)}$$

$$\sin(x \pm y) = \sin x \cos y \pm \cos x \sin y$$
$$\cos(x \pm y) = \cos x \cos y \mp \sin x \sin y$$
$$\tan(x \pm y) = \frac{\tan x \pm \tan y}{1 \mp \tan x \tan y}$$
$$2 \sin x \sin y = \cos(x - y) - \cos(x + y)$$
$$2 \sin x \cos y = \sin(x + y) + \sin(x - y)$$
$$2 \cos x \cos y = \cos(x + y) + \cos(x - y)$$
$$\sin 2x = 2 \sin x \cos x$$

Mathematical Formulas

$$\int \ln x\,dx = x\ln x - x + C$$

$$\int \sin ax\,dx = -\frac{1}{a}\cos ax + C$$

$$\int \cos ax\,dx = \frac{1}{a}\sin ax + C$$

$$\int \sin^2 ax\,dx = \frac{x}{2} - \frac{\sin 2ax}{4a} + C$$

$$\int \cos^2 ax\,dx = \frac{x}{2} + \frac{\sin 2ax}{4a} + C$$

$$\int x\sin ax\,dx = \frac{1}{a^2}(\sin ax - ax\cos ax) + C$$

$$\int x\cos ax\,dx = \frac{1}{a^2}(\cos ax + ax\sin ax) + C$$

$$\int x^2\sin ax\,dx = \frac{1}{a^3}(2ax\sin ax + 2\cos ax - a^2x^2\cos ax) + C$$

$$\int x^2\cos ax\,dx = \frac{1}{a^3}(2ax\cos ax - 2\sin ax + a^2x^2\sin ax) + C$$

$$\int e^{ax}\sin bx\,dx = \frac{e^{ax}}{a^2+b^2}(a\sin bx - b\cos bx) + C$$

$$\int e^{ax}\cos bx\,dx = \frac{e^{ax}}{a^2+b^2}(a\cos bx + b\sin bx) + C$$

$$\int \sin ax\sin bx\,dx = \frac{\sin(a-b)x}{2(a-b)} - \frac{\sin(a+b)x}{2(a+b)} + C, \qquad a^2 \neq b^2$$

$$\int \sin ax\cos bx\,dx = -\frac{\cos(a-b)x}{2(a-b)} - \frac{\cos(a+b)x}{2(a+b)} + C, \qquad a^2 \neq b^2$$

$$\int \cos ax\cos bx\,dx = \frac{\sin(a-b)x}{2(a-b)} + \frac{\sin(a+b)x}{2(a+b)} + C, \qquad a^2 \neq b^2$$

$$\int \frac{dx}{a^2+x^2} = \frac{1}{a}\tan^{-1}\frac{x}{a} + C$$

$$\int \frac{x^2\,dx}{a^2+x^2} = x - a\tan^{-1}\frac{x}{a} + C$$

$$\int \frac{dx}{(a^2+x^2)^2} = \frac{1}{2a^2}\left(\frac{x}{x^2+a^2} + \frac{1}{a}\tan^{-1}\frac{x}{a}\right) + C$$