وزارة التعليم العالي والبحث العلمي
كلية المستقبل الجامعة
القسم: هندسة الطب الحياتي
المرحلة: الثانية
الدراسة: الصباحية - المسائية

المادة: مختبر الدوائر الكهربائية
الزمن: 75 دقيقة
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الشعبة: B

NOTE: Attempt any 5 questions **(10 points for each question)**

Q1. In electronics, what is a capacitor, and what does it consist of?

A capacitor C is formed whenever two conductors are separated by an insulating material. Consider the simple example of two parallel conducting plates separated by a small gap that is filled with an insulating material (vacuum, air, glass, or another dielectric).

Q2. Identify the measuring units and abbreviation for **5** of the following electrical parameters:

Electrical parameters	**Measuring units**	**Abbreviation**
Voltage	Volt	V
Current	Ampere	A, amp
Resistance	Ohm	Ω
Capacitance	Farad	F
Charge	Coulomb	C
Inductance	Henry	H
Impedance	Ohm	Ω
Frequency	Hertz	Hz

Q3. In series R-L-C circuits, why does the value of the phase shift (θ) change from negative to positive when we increase the frequency?

Capacitive reactance X_C of the capacitor decreases as the frequency f increases. Since X_C is inversely proportional to f. ($X_C = 1/2\pi fC$). In other hand, the inductive reactance X_L of the inductor increases when f is increase (Direct Proportional: $X_L = 2\pi fL$).
Therefor, the direction of θ vector change from negative to positive as the X_C become smaller than X_L

$$\theta = \tan^{-1}\frac{X_L - X_C}{R}$$

Q4. What are the applications of a series R-L circuit?

Used as high pass filter or low pass filter. Used as chokes of tube lights. Used in the filtering of low power signals and stores energy in the form of potential magnetic energy.

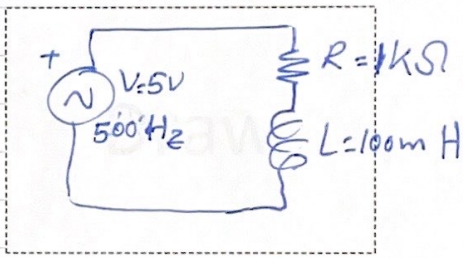
Q5. A resistor R (1 kΩ) and an inductor L (100 mH) are connected in series, supplied by an AC voltage of Vp.p. 5 V and frequency of 500 Hz. Draw the circuit in detail and calculate the current?

$X_L = 2\pi f L = 2 * 3.14 * 500 * 100 * 10^{-3}$

$= 314.0\ \Omega$

$Z = \sqrt{R^2 + X_L^2} = 1048.13\ \Omega$

$I = \frac{V}{Z} = \frac{5}{1180.8} = 4.77\ mA$



Q6. A resistor R (1 kΩ) and a capacitor C (0.1 μF) are connected in series, supplied by an AC voltage of Vp.p. = 5 V and a frequency of 1 kHz. Draw the circuit in detail and calculate the phase difference between the voltage across the capacitor and current?

$X_C = \frac{1}{2\pi f C} = \frac{1}{2 * 3.14 * 1000 * 0.1 \times 10^{-6}}$

$= 1592.3\ \Omega$

$\theta = \tan^{-1} \frac{-X_C}{R} = \frac{1592.3}{1000}$

$\theta = 57.8^{0}$