UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2012/2013

COURSE NAME	:	ELECTRICAL TECHNOLOGY
COURSE CODE	:	BEE 10403 / BEX 10303 / BEE 1223
PROGRAMME	:	BEB/BEC/BED/BEE/BEH/BEU
EXAMINATION DATE	:	JUNE 2013
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

Q1 (a) Given the sinusoid $v_s = 5\text{Sin}\,(4\pi t - 60^o)\text{V}$. Determine its:

(i) amplitude (1 marks)

(ii) angular frequency (1 marks)

(iii) period (2 marks)

(iv) frequency (2 marks)

(v) v_s at t = 2.5ms (2 marks)

(b) Simplify the following expression:

$$\frac{(240\angle 75^o + 160\angle -30^o)(60 - j80)}{(67 + j84)(20\angle 32^o)}$$

(4 marks)

(c) Find a single sinusoid corresponding to each of these phasors:

(i) $\boldsymbol{V_1} = 40\angle -60^o\ V$ (2 marks)

(ii) $\boldsymbol{V_2} = 6 + j8,\ \omega = 40$ (2 marks)

(d) Calculate the phase angle between i_1 = -4 sin (277t + 25°) and i_2 = 5 cos (277t - 40°). Determine if i_1 lead or lags i_2? Draw a phasor diagram showing i_1 and i_2. (4 marks)

Q2 (a) Using your own words to explain the resonance conditions.

(4 marks)

(b) Based on the R-L circuit shown in **Figure Q2(b)**; Calculate the current, I, in the circuit. Give your answer in polar form.

(6 marks)

(c) Referring to **Figure Q2(b)**, if a capacitor with capacitance of 500nF is now connected in parallel with the inductor, find

(i) the total impedance of the circuit, Z

(3 marks)

(ii) the resonant frequency of the circuit

(3 marks)

(iii) the current, I, flowing in the circuit during the resonant frequency

(4 marks)

Q3 (a) In your own words and with the aid of an appropriate diagram, explain the principle of mutual induction.

(5 marks)

(b) A magnetic material has a magnetic field strength of 1000 At/m and a flux density of 480 mT. Given that the permeability at free space is $4\pi \times 10^{-7}$, calculate:

(i) the relative permeability of the material

(5 marks)

(ii) the magnetomotive force (m.m.f) required to produces the above flux density in an air-gap of 1 mm width

(5 marks)

(iii) the current flow in 1000 turns to produce m.m.f in **Figure Q3(b)(ii)**

(5 marks)

Q4 (a) Describe the **TWO (2)** advantages of three phase system (compared to single phase systems) and give your reason.

(4 marks)

(b) A delta-connected 415 V, 50 Hz, 3-phase supply is connected to a Y-connected balanced load. Each phase of the load consists of a resistance of 25Ω and inductance 0.1 H, connected in series. Given the phase angle of V_{AB} is zero:

(i) find line to neutral voltage, V_{an}

(3 marks)

(ii) calculate the line current drawn from the supply, I_{aA}

(3 marks)

(iii) sketch a phasor diagram showing V_{AB}, V_{an} and I_{aA}

(2 marks)

(c) A balanced positive sequence wye-connected 120 Hz, 3-phase supply has phase voltages of V_Y = 100V. This source is connected to a delta-connected balanced load through wires having impedance of Z_{line} = 0.2+j0.4 Ω. Given that the impedance of each phase of the load is Z_Δ = 25-j8 Ω and the phase angle of V_{an} is -15°;

(i) calculate line to line voltage at the load, V_{AB}

(2 marks)

(ii) calculate current in each phase of the load, I_{AB}

(4 marks)

(iii) sketch a phasor diagram showing V_{AB} and I_{AB}

(2 marks)

Q5 (a) Explain briefly **TWO (2)** losses that occur in a transformer.

(4 marks)

(b) A 100 kVA transformer has 400 turns on the primary and 80 turns on the secondary. The primary and secondary resistance are 0.3 Ω and 0.01 Ω, respectively. While the corresponding leakage reactances are given by 1.1 Ω and 0.035 Ω, respectively. Given that the supply voltage is 2200 V.

(i) Calculate the equivalent impedance referred to the primary circuit

(5 marks)

(ii) Determine the voltage regulation and the secondary terminal voltage for full load having a power factor of 0.8 lagging

(5 marks)

(c) An ideal transformer, connected to a 240V main, supplies a 12V, 150 W lamp.

(i) Calculate the transformer turns ratio

(3 marks)

(ii) Determine the current taken from the supply

(3 marks)

- END OF QUESTION -

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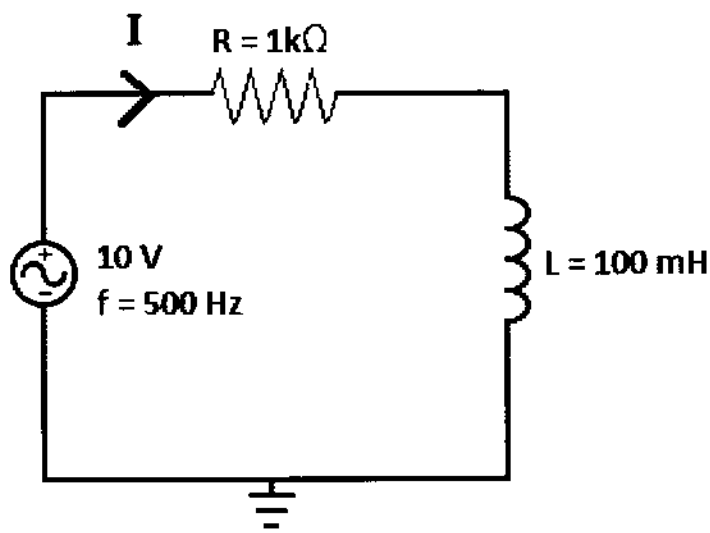

FIGURE Q2(b)