UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2012/2013

COURSE NAME : ELECTRIC CIRCUIT ANALYSIS II

COURSE CODE : BEF 12503

PROGRAMME : 2 BEF

EXAMINATION DATE : JUNE 2013

DURATION : 3 HOURS

INSTRUCTION : ANSWER **ALL** QUESTIONS

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

Q1   In the circuit of Figure Q1, R = 1 Ω, and C = 0.1 μF and the dc voltage applied to the circuit is 5 V. If the switch is closed at time t = 0 s, find the particular solution for current i(t) flowing in the the circuit for time t ≥ 0. Assume zero initial charge is stored in the capacitor.

(20 marks)

Q2   The voltage $v_S(t)$ = 100cos(400t + 60°) is applied to the circuit shown in Figure Q2 at time t = 0. The resistance R has a value of 40 Ω and the inductor has an inductance value of 75 mH. Find the particular solution for current i(t) flowing in the circuit for t ≥ 0. Asume zero initial current in the inductor.

(20 marks)

Q3   (a)   Transform the delta connection shown in Figure Q3(a) into a star connection.

(5 marks)

   (b)   For the circuit shown in Figure Q3(b), find:

   (i) $\bar{I}_1$

(5 marks)

   (ii) $\bar{I}$

(5 marks)

   iii) $\bar{V}_{AC}$

(5 marks)

Q4   (a)   Explain the maximum power transfer theorem for a linear a.c. circuit.

(5 marks)

   (b)   For the circuit shown in Figure Q4, find:

   (i)   the Thevenin equivalent circuit seen by the impedance $\bar{Z}$

(7 marks)

   (ii)   the value of $\bar{Z}$ so that maximum power is transferred to it

(1 mark)

   (iii)   the maximum power transferred to $\bar{Z}$

(7 marks)

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Q5 (a) Explain the terms *active power*, *reactive power*, *apparent power*, and *power factor* of a single phase load.

(4 marks)

(b) A parallel circuit consisting of two branches is connected across a 240 V, 50 Hz a.c. supply. The first branch consists of a coil having a resistance of 30 Ω and an inductance of 100 mH, and the other branch consists of a 40-Ω resistor in series with a 100 μF capacitor. Calculate:

(i) total impedance of the circuit

(4 marks)

(ii) all branch currents

(4 marks)

(iii) magnitude of supply current

(2 marks)

(iii) active power consumed by the circuit

(2 marks)

(iv) Draw a phasor diagram showing the magnitudes and phase angles of the supply and branch currents relative to the supply voltage.

(4 marks)

Q6 (a) Explain the terms *resonance* and *Q-factor* of a series RLC circuit.

(5 marks)

(b) A circuit consists of an inductor of 0.05 H and a resistance 5 Ω in series with 0.1 μF. If the whole circuit is now connected across a 100 V a.c. supply, calculate:

(i) the resonant frequency (Hz),   (3 marks)

(ii) the supply current at resonance,   (3 marks)

(iii) the rms voltage drop across each component at resonance,   (3 marks)

(iv) the Q factor, and   (3 marks)

(v) the bandwidth (Hz).   (3 marks)

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FIGURE Q1

FIGURE Q2

FIGURE Q3(a)
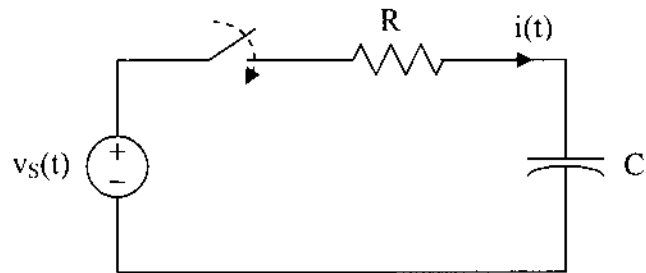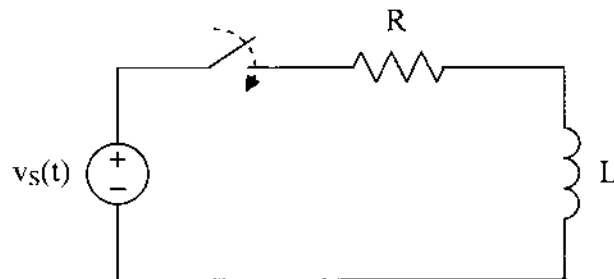

FIGURE Q3(b)

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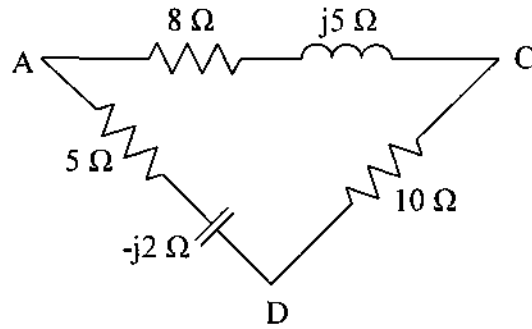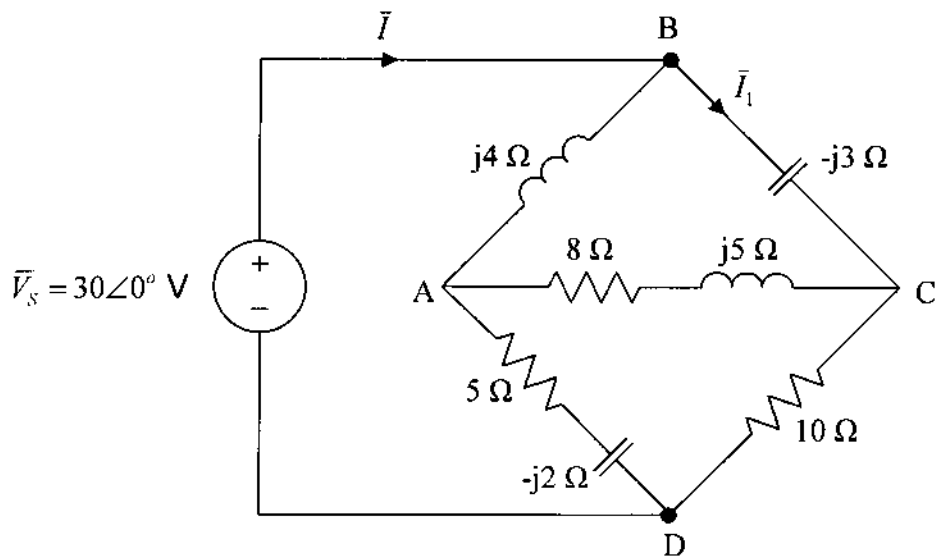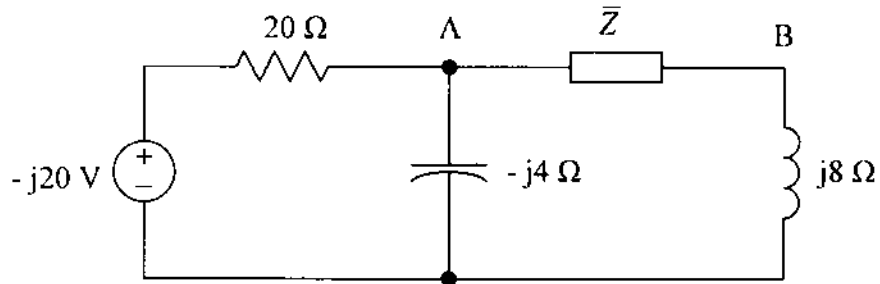

FIGURE Q4