UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2010/2011

COURSE NAME	:	ELECTRICAL AND ELECTRONIC TECHNOLOGY
COURSE CODE	:	BEX 17003 / BEE 1803
PROGRAMME	:	1 Bachelor of Mech. Eng. (Hons)
EXAMINATION DATE	:	APRIL/MAY 2011
DURATION	:	2 1/2 HOURS
INSTRUCTIONS	:	ANSWER **FOUR (4)** QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF EIGHT (8) PAGES

Q1 (a) With the aid of diagrams, explain

(i) Kirchhoff's current law

(ii) Kirchhoff's voltage law

(6 marks)

(b) Find the current, I and voltage, V_{ab} in the circuit of **Figure Q1(b).**

(7 marks)

(c) Use the nodal or mesh analysis to find the voltages across the 40Ω, 10 Ω and 20 Ω resistors for the circuit in **Figure Q1(c).**

(12 marks)

Q2 (a) Describe the steps to apply superposition principle to circuits that have more than one source.

(5 marks)

(b) For the circuit in **Figure Q2(b)**, find the current I, using the superposition principle.

(7 marks)

(c) For the circuit in **Figure Q2(c)**:

(i) find the Thevenin's equivalent circuit with respect to the terminals a,b

(8 marks)

(ii) use source transformation to obtain the Norton's equivalent circuit

(3 marks)

(iii) find the value of the load resistor to be connected to terminals a,b so that maximum power can be transferred to it

(2 marks)

Q3 (a) Write a brief description of the following: capacitor, inductor and mutual inductance.

(6 marks)

(b) Find the equivalent capacitance for the circuit in **Figure Q3(b)**. Calculate the voltage across, the charge, and energy stored in each of those capacitors.

(14 marks)

(c) Find the voltage across terminal a-b of the circuit in **Figure Q3(c)** if the current i(t) = 0.5 cos 314t A.

(5 marks)

Q4 (a) For the circuit in **Figure Q4(a)**, find:
(i) the total circuit impedance
(ii) the current i(t)
(iii) the voltage across the capacitor, Vc(t)

(9 marks)

(b) For the circuit in **Figure Q4(b)**, $\mathbf{V}_S(t) = 450\cos(314t)$ and $Z_L = (7 + j1)\ \Omega$:
(i) calculate the complex power and draw the power triangle
(ii) find the required parallel capacitor needed to improve the power factor to unity

(11 marks)

(c) Explain why large companies need to correct their power factor. Explain the technique used to improve the power factor of a given load.

(5 marks)

Q5 (a) Sketch the typical voltage/current characteristics for a rectifier diode and a zener diode.

(4 marks)

(b) Briefly explain how EACH of the diodes in part Q5(a) operates under forward and reverse bias conditions.

(4 marks)

(c) Sketch the circuit of a full-wave bridge rectifier with transformer input and a reservoir capacitor. Briefly explain how this circuit achieves full rectification.

(7 marks)

(d) Draw the truth table for <u>EACH</u> of the following types of 2-input logic gate.
(i) OR
(ii) NOR
(iii) AND

(6 marks)

(e) For the logic circuit shown in **Figure Q5(e)** state the possible inputs to give an output of logic 1 from the circuit

(4 marks)

Q6 (a) With the aid of diagrams, explain how the speed of DC series and shunt wound motors may be controlled.

(6 marks)

(b) A 300V DC series motor runs at 15 revs/sec and takes an armature current of 30A. If the armature resistance is 0.5 Ω, calculate the torque developed by the motor.

(4 marks)

(c) Describe with sketches two different ways of starting a single-phase induction motor.

(6 marks)

(d) A 5 kW, 240V, 50Hz induction motor has a running power factor of 0.7 lagging and an efficiency of 80%. Calculate the current drawn by the motor.

(4 marks)

(e) List three advantages of fluorescent lighting units as compared to incadescent lamps.

(3 marks)

(f) A fluorescent tube fixture takes 1A when connected to a 120V source. A wattmeter in the circuit reads 80 watts. What is the operating power factor of this unit.

(2 marks)

FINAL EXAMINATION

SEMESTER / SESSION : SEM II / 2010/2011 PROGRAMME : 1 BDD
COURSE : ELECTRICAL AND ELECTRONIC TECHNOLOGY
COURSE CODE: BEX17003 / BEE1803

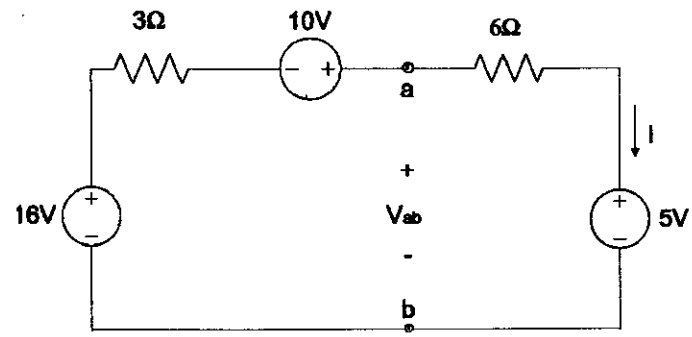

FIGURE Q1(b)

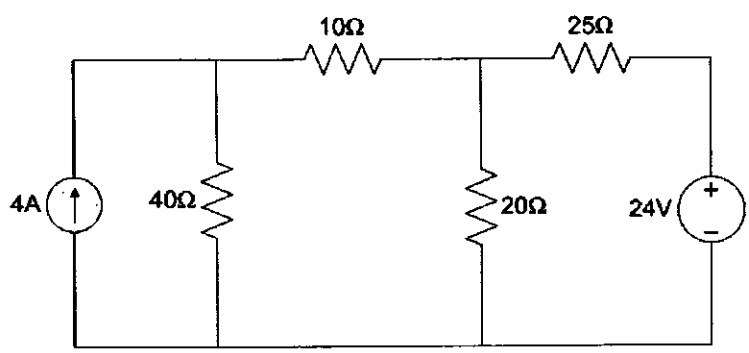

FIGURE Q1(c)

FINAL EXAMINATION

SEMESTER / SESSION : SEM II / 2010/2011 PROGRAMME : 1 BDD
COURSE : ELECTRICAL AND ELECTRONIC TECHNOLOGY
COURSE CODE: BEX17003 / BEE1803

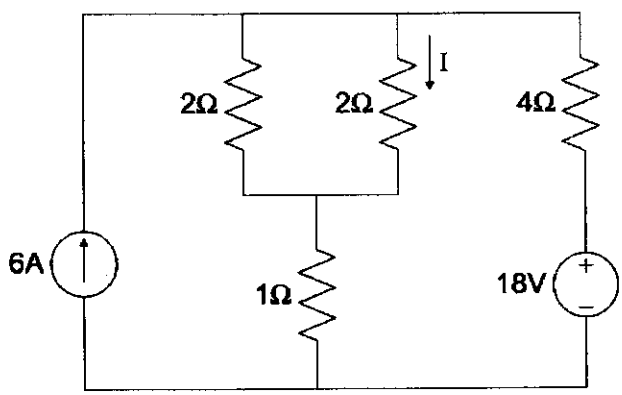

FIGURE Q2(b)

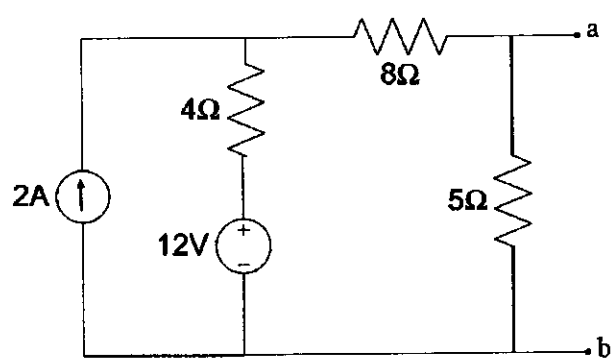

FIGURE Q2(c)

FINAL EXAMINATION

SEMESTER / SESSION : SEM II / 2010/2011 PROGRAMME : 1 BDD
COURSE : ELECTRICAL AND ELECTRONIC TECHNOLOGY
COURSE CODE: BEX17003 / BEE1803

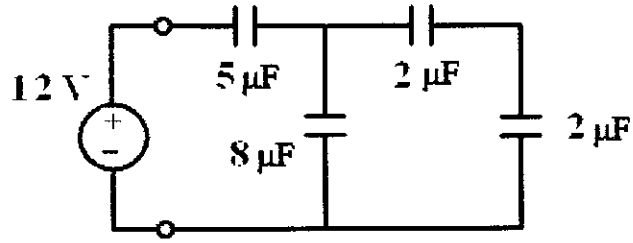

FIGURE Q3(b)

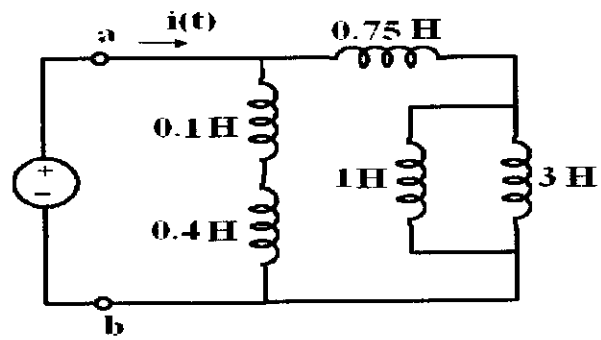

FIGURE Q3(c)

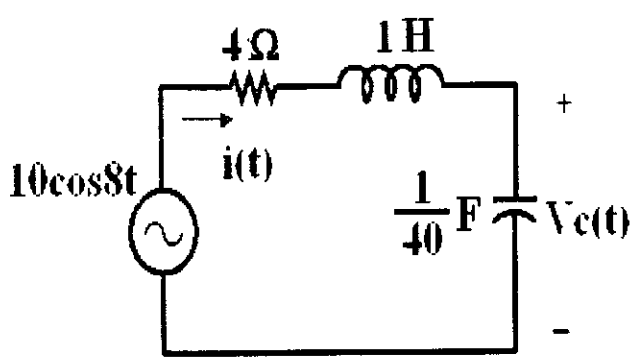

FIGURE Q4(a)

FINAL EXAMINATION

SEMESTER / SESSION : SEM II / 2010/2011 PROGRAMME : 1 BDD
COURSE : ELECTRICAL AND ELECTRONIC TECHNOLOGY
COURSE CODE: BEX17003 / BEE1803

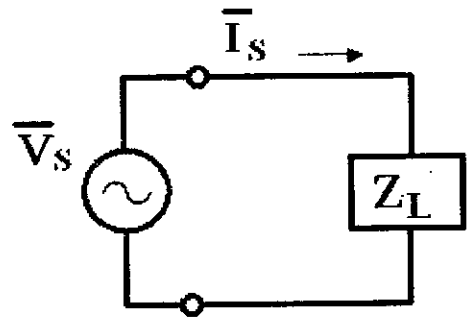

FIGURE Q4(b)

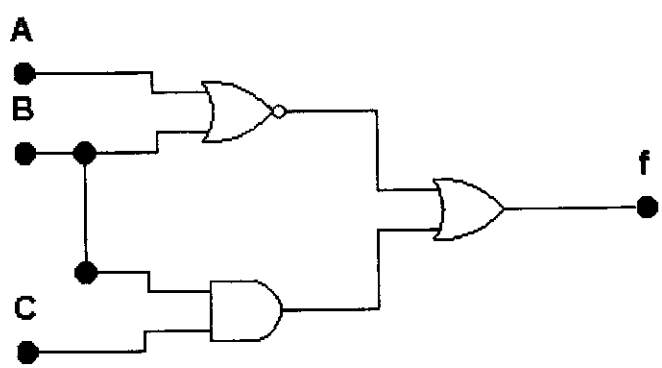

FIGURE Q5(e)