KENYA METHODIST UNIVERSITY

END OF FIRST TRIMESTER 2008 EXAMINATIONS

FACULTY	**:**	**SCIENCE AND SOCIAL STUDIES**
DEPARTMENT	**:**	**COMPUTER AND INFORMATION SCIENCE**
COURSE CODE	**:**	**PHYS 310**
COURSE TITLE	**:**	**ELECTRICAL CIRCUITS**
TIME	**:**	**2 HOURS**

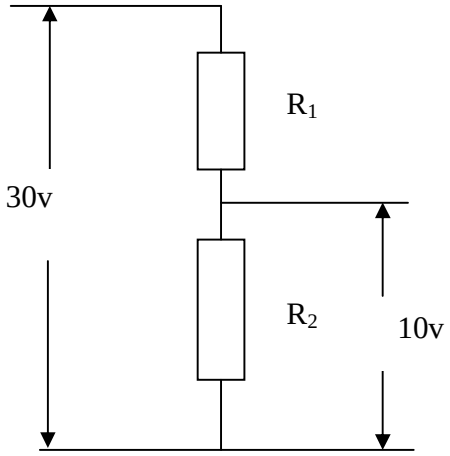
Instructions:

- *Answer question **ONE** (compulsory) and any other **TWO** questions.*

Question 1

a) Discuss the distinction between loads connected in series and loads connected in parallel. (4 mks)

b) A voltage divider is to give an output voltage of 10v from an input voltage of 30v as shown.



Calculate the resistance R_1, given $r_2 = 100\Omega$. (5 mks)

c) An a.c generator consists of 8 turns of wire of area A=0.09m^2 and total resistance 12Ω. the loop operates in a magnetic field B=0.5T at a constant frequency of 60Hz. Calculate the :-
(i) Maximum induced e.m.f.
(ii) Maximum induced current. (7 mks)

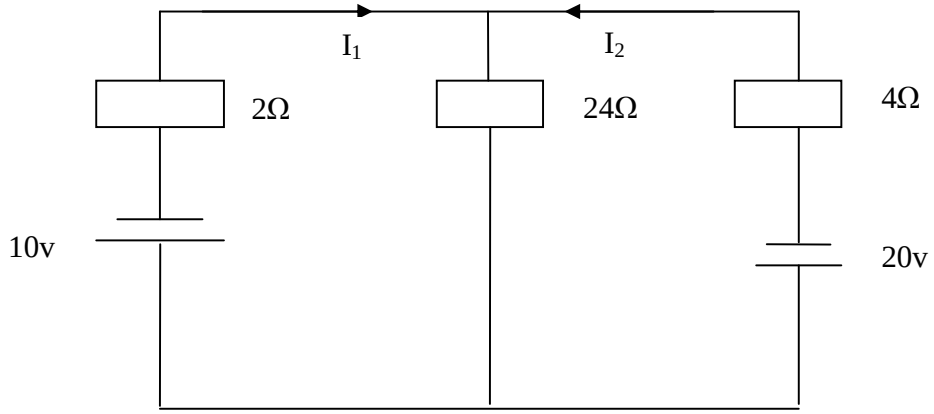
d) Draw phase diagrams showing relationship between the maximum voltage and current vectors for a resistor, inductor and capacitor. (6 mks)

e) A resistance of 7 Ω is connected in series with a pure inductance of 31.4mH and the circuit is connected to a 100v, 50Hz sinusoidal (ax) supply. Calculate the:-
(i) Circuit current. (4 mks)
(ii) Phase angle. (4 mks)

Question 2

a) State the superposition theorem. (4 mks)

b) With reference to the circuit diagram shown below, use the superposition theorem to determine the value of the currents I_1 and I_2 respectively. (11 mks)



Question 3

a) State Faraday's law of induction. (3 mks)

b) Explain how a d.c generator operates. (5 mks)

c) A coil is wrapped with 200 turns of wire on the perimeter of a square frame of sides 18cm. Each turn has the same area, equal to that of the frame, and the total resistance of the coil is 2Ω. A uniform magnetic field is turned on perpendicular to the plane of the coil. If the field changes linearly from 0 to 0.5Wb/m^2 in a time of 0.8 seconds, calculate the magnitude of:-
(i) Induced e.m.f in the coil while the field is changing. (4 mks)
(ii) Induced current in the coil while the field is changing. (3 mks)

Question 4

An alternating voltage supply contains in its circuit the following elements, inductor, L = 230mH, capacitor, C = 15mF and resistor, R=160 Ω. All are connected in series.

a) Using mathematical expressions differentiate between the terms reactance and impedance as used in a.c supply. (4 mks)
b) Given that the elements given above operate on a 60Hz and 360v a.c supply, calculate
(i) Impedance, z. (6 mks)
(ii) Amplitude current, I_m. (2 mks)
(iii) Phase angle θ. (3 mks)