FEDERAL UNIVERSITY OF TECHNOLOGY OWERRI

SCHOOL OF ENGINEERING & ENGINEERING TECHNOLOGY

ELECTRICAL & ELECTRONIC ENGINEERIN DEPARTMENT

2014/215 RAIN SEMESTER EXAMINATION

Introduction to Electrical & Electronic Engineering: ENG 226 (3Units)

Instructions: Answer Question 1 and any other four: **Time Allowed** 3 Hours

(1)(a) State De Morgan's Law

(b) Write the complete expression for the Minterm designation

(c) Simplify and implement $Z = (E + F)(E + \overline{EF})G + \overline{E}(F + \overline{G}) + \overline{E}F + EFG$

(d) Define the term resonance and state the two conditions under which it occurs?

(e) The formulae for computing resonance frequency is ....

(f) One practical application of resonance in hospital or engineering firm is .....

(g) The quantities to be modeled in a transformer are .....

(h) One major difference between an electric motor and a generator is .....

i) State Kirchhoff's current and voltage laws

(j) Current flowing across a capacitor in a transient circuit is calculated using....

2(a) What are the tools for understanding digital logic gates

(b) (i) Draw a two input OR gate symbol and write out its Boolean expression.

(ii) Represent an OR function by a switch analogy

(c) (i) Write out the correct Boolean expression for the truth Table I shown in the next page.

(ii) What is the name given to the gate that has this expression?

(iii) Draw the symbol of this gate.

(iv) Show another way of writing this expression.

3(a) Analyze the role a transformer plays in bringing AC voltage to your home from the generation station.

(b) With the aid of electromagnetic laws, describe the transformer action.

(c) Draw a well labeled transformer action.

(d) A 400kVA, 11kV/415V, 50Hz transformer has 80 turns on the secondary, Calculate:

(i) Primary and secondary currents

(ii) Number of primary turns (to the nearest whole number)

(iii) The maximum flux.

4(a) (i) With appropriate circuitry, explain what you understand by transient

(ii) State five relevancies of its study to you.

(b) Using a series RC circuit, determine the differential equation for capacitor current and voltage.

(c) State the capacitor voltage equations for charging and discharging of capacitor as transient examples.

(d) For a 2.4V supply and time constant of 0.45, compute the level of voltage that will build across a capacitor 0.48s.

5(a) Two batteries A and B are connected in parallel and a load of 10Ω is connected across their terminals. A has an EMF of 12V and an internal resistance of 2Ω; B has an EMF of 8V and an internal resistance of 1Ω.
(i) Use Kirchhoff's laws to determine the values and directions of the currents flowing in each of the batteries and in the external resistance.
(ii) Determine the potential difference across the external resistance.
(b) Use Superposition theorem to find current I in the circuit shown in Fig 1 below. All resistances are in ohms.

6(a) Briefly discuss the process doping and its reason. Explain briefly the formation of the N-type semiconductor.
(b) Determine the input voltage necessary to give an output voltage of 3V in an ideal amplifier with a Voltage gain (Av) of 40dB.
(c) List the different stages in a power supply unit and name one component that can be applied in each stage.
(d) A certain electric circuit with supply voltage of 10v has a silicon diode connected in forward bias with a 30kΩ resistor **(i)** Illustrate the circuit **(ii)**Calculate the power dissipated by the diode.

7(a) Sketch the waveform of a pure single phase sinusoidal signal and explain the terms used to describe it.
(b) Using simple series circuits, differentiate between reactance and impedance,
(c) (i) State its capacitor and inductor current equations **(ii)** In which one is the current leading the voltage, and what is the significance of this to you?
(d) If supply voltage is $v_s(t) = v_i(t) = 1.2\sin 120\pi t$, compute the current that passes across an inductor of 48 mH.
(e) Explain how this course may help you improve power supply in your neighborhood.

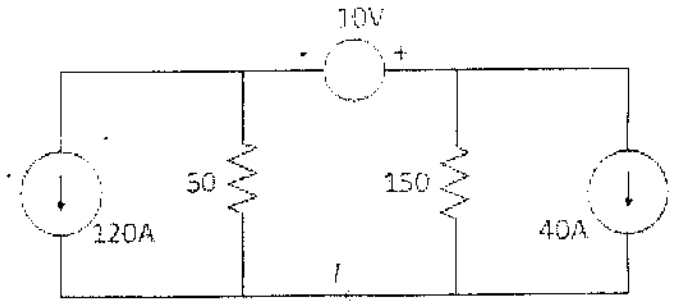

Figure 1

Table 1

X	Y	Z
0	0	1
0	1	0
1	0	0
1	1	1