FNU FIJI NATIONAL UNIVERSITY

COLLEGE OF ENGINEERING, SCIENCE & TECHNOLOGY

SCHOOL OF ELECTRICAL & ELECTRONIC ENGINEERING

TRADES CERTIFICATE IN ELECTRONIC ENGINEERING STAGE 3

UNIT CODE: EEE411 **UNIT NAME**: ELECTRICAL PRINCIPLES III

FINAL EXAMINATION – PENSTER III 2017

DAY/DATE: **TIME:**

ROOM:

INSTRUCTIONS TO STUDENTS

1. **You are allowed 10 minutes extra time during which you are not to write.**
2. **Write your candidate number on the top of each sheet of the answer booklet.**
3. **Write all your answers in the answer booklet provided.**
4. **For all sheets of paper on which rough/draft work has been done, cross it through and attach these to your answer script.**
5. **Remove the section A answer sheet from the examination paper and insert it in the answer script then secure with a string**
6. **Attempt all the Questions.**

SECTION A **MULTIPLE CHOICE** **20 MARKS**

*Write the **Alphabet** of the **best choice** in the Answer Sheet attached at the back of the question paper. When you have completed this section, remove the answer sheet, insert it into the answer booklet and tie with a string.*

1) With respect to frequency response what are the elements that determine changes in the circuit output levels?
   A) Capacitors only.
   B) Capacitors and inductors.
   C) Inductors only.
   D) Capacitors, frequencies and inductors.

2) The Bandwidth of an amplifier can be calculated from:
   A) $BW = f_2/f_1$
   B) $BW = f_2 + f_1$
   C) $BW = f_2 - f_1$
   D) $BW = (f_2 - f_1) \div 2$

3) The total reactance at resonant frequency in a series resonance circuit is:
   A) 0 Ω
   B) X_L
   C) X_C
   D) 1 Ω

4) The current flowing in series resonance circuit is:
   A) Fluctuating
   B) Maximum
   C) Minimum
   D) Almost zero

5) The outer shield of the coaxial cable is for:
   A) Cable grounding.
   B) Transmitter earthing
   C) Stop the RF signal from radiating outwards.
   D) For catenary wiring purposes.

6) The tendency for high frequency electric current to flow mostly near the surface of the conductor is called:
   A) Surface Wave
   B) Skin Wave
   C) Skin Effect
   D) Surface Conductance

7) Which of is correct about a step down transformer:
   A) $V_p < V_s$
   B) $N_p < N_s$
   C) $I_p < I_s$
   D) $I_p > I_s$

8) A device that has a spinning shaft and uses electricity as the input or output is called a _____.

   A) motor
   B) syncho
   C) generator
   D) rotating machine

9) Two categories of rotating machinery are:
   A) AC and DC
   B) Stepper and synchronous
   C) Motor and generators
   D) Incremental and continous

10) The brushes in modern motors are mainly made of
   A) Copper
   B) Zinc
   C) Iron
   D) Carbon

11) A device that converts electrical energy into mechanical energy is called:
   A) Motor
   B) Regulator
   C) Engine
   D) Generator

12) A filter which allows the higher frequency components of the applied voltage to develop output voltage across the load resistance, while the lower frequency components are attenuated or reduced, in the output.
   A) Low Pass Filter
   B) High Pass Filter
   C) Band Pass Filter
   D) Band Stop Filter

13) What are the types of losses associated with transmission lines?
   A) Resistive, capacitive, inductive
   B) Capacitive, dielectric, resistive
   C) Electromagnetic, resistive, inductive
   D) Capacitive, passive, active

14) The amount of voltage induced in the transformer secondary depends on:
   A) Self Inductance
   B) Length of Core
   C) Input Voltage
   D) Mutual Inductance

15) There is no voltage gain in a parallel-resonant circuit because:
   A) $X_L = X_c$
   B) There is no amplifying device
   C) Voltage is the same across all parts of a parallel circuit.
   D) Current is too low

16) The cut-off frequencies at the two sides of resonance which determine the BW of the circuit is about____ of the maximum output.
   A) 90%
   B) 70%
   C) 50%
   D) 75%

17)The ratio of smallest RMS voltage value to the largest is called the:

A) VSWR
B) ISWR
C) Characteristic Impedance
D) Reflection Coefficient

18)A transformer with a turn's ratio of **1:3** has what current ratio?

A) 3:1
B) 1:1
C) 1:3
D) $\sqrt{2} = 1$

19) Resonance occurs when

A) $X_L = R$
B) $X_L = X_C$
C) $L = C$
D) $F_r = f_c$

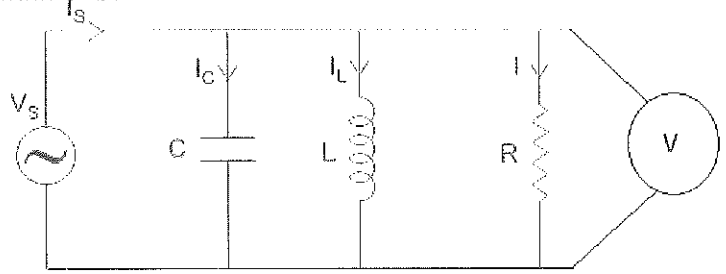
20) Resonant tuned circuits are used in

A) Logic circuits
B) Radio receivers
C) Power distribution control
D) Motor speed regulation

SECTION B **FREQUENCY RESPONSE** **20 MARKS**

1. Define the following terms:
   i) Band pass filters
   ii) Frequency response in terms audio equipment. **(4 marks)**

2. In a parallel resonant circuit, what would be the voltage readings across the resistor in these two situations?



i) open inductor
ii) shorted capacitor **(4 marks)**

3. A. In a resonant series circuit with an open inductor, what would be the voltage measured across the resistor? **(2 marks)**

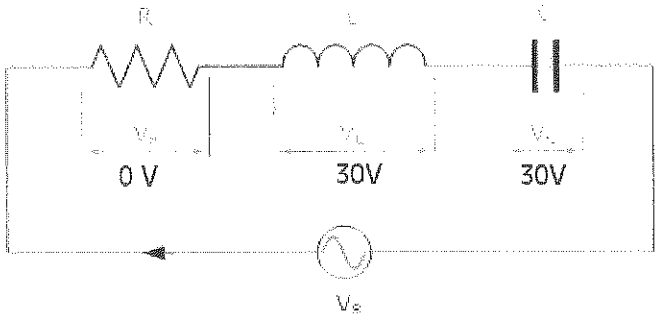
B). What measurement would indicate to you that you have an open circuit in one of the branch of a parallel resonant circuit? **(2 marks)**

4. With the aid of a diagram, clearly explain how you would perform a frequency response measurement of and audio amplifier. What components will you most likely to be testing out if the frequency response is not up to specifications and why? **(8 marks)**

SECTION C **RESONANCE** **15 MARKS**

1. A). You are given a faulty audio equipment to repair. You did some measurements around the series resonant section of its circuitry and found out the following readings:

i) 30 Vdc across the inductor
ii) 30 Vdc across the capacitor
iii) 0 Vdc across the resistor



What could be the fault in the above situation?

(2 marks)

B). If the series resonant circuit above utilizes 12 volts as its supply, and you measure 12 volts across the resistor and zero volts across the inductor and the capacitor, what component could be faulty and what type of fault is it? **(2 marks)**

2). Find out the frequency at which resonance occurs in the circuit of Figure 1:0 below. **(5 marks)**

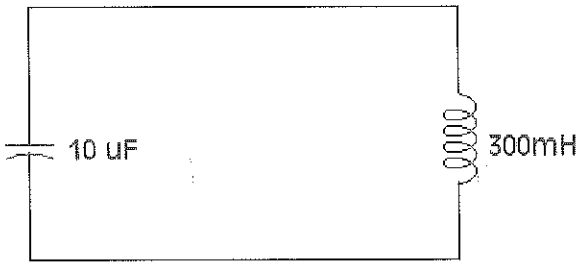


Figure 1:0

3). In a parallel-resonant circuit, what is the relationship between impedance and current? **(2 marks)**

4). When is line current minimum in a parallel-LC circuit? **(2 marks)**

5). In a series-RLC circuit, what is the condition of the circuit if there is high impedance, low current, and low reactance voltages? **(2 mark)**

SECTION D **TRANSMISSION LINES** **15 MARKS**

1.
Determine the wavelengths for electromagnetic waves in free space with the following frequencies:

a). 300 Hz
b). 300 KHz
c) 300 MHz **(6 marks)**

2.
a) State the main function of transmission line. **(1 mark)**
b) Draw and label clearly the diagram of a coaxial cable. **(1 mark)**
c) List down two types of coaxial cables used in the industry. **(1 mark)**

3.
Define the following terms:

a). Velocity of propagation
b). Characteristic Impedance
c). Standing wave ratio (SWR) **(3 marks)**

4.
You have received a call to attend to a fault at a radio base station. You suspect the fault to be at the transmission line. What condition of the line will you be testing for, list down the tools you will need and the procedure you will undertake to carry out the test. **(3 marks)**

SECTION E: TRANSFORMERS 15 MARKS

1.
Briefly explain what a transformer is and list down 3 of its common applications.
(5 marks)

2.
State two types of losses in a transformer and the effects they exhibit.
(2 marks)

3.
A step up transformer has 120 volts in the primary and a turns ratio of 1:8. **(3 marks)**
What is the secondary voltage? (Show all working)

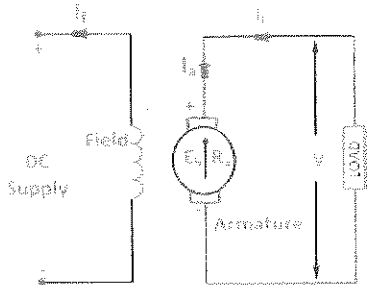
4.
List 5 types of routine transformer tests that a maintenance technician should carry out.
(5 marks)

SECTION F **DC MACHINES** **15 MARKS**

1.

A) What type of electrical machine is shown in the diagram below?

(1 mark)



B) What is the advantage and disadvantage of the above machine? **(1 mark each)**

2.

List down the 4 main parts of a dc motor and briefly describe their functions.

(4 marks)

3.

What precaution should be taken before removing the end plates of a motor or generator and for what reason? **(2 marks)**

4.

You are handed a capacitor start fan motor that is not running when turned on but does run when the blades are turned swiftly by hand. Draw the schematic diagram of this motor and explain the procedures for isolating the fault and then rectifying it. **(6 marks)**

END of EXAMINATION.