



FIJI NATIONAL UNIVERSITY

COLLEGE OF ENGINEERING, SCIENCE & TECHNOLOGY

SCHOOL OF ELECTRICAL & ELECTRONIC ENGINEERING

CERTIFICATE IV IN ELECTRONIC ENGINEERING STAGE 2

UNIT CODE: EEE307 UNIT TITLE: ELECTRICAL PRINCIPLES II

FINAL EXAMINATION –PENSTER II 2017

DAY/DATE:

TIME:

ROOM:

INSTRUCTION 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. For section A, the answer sheet is attached to the back of this question paper which you will need to remove and insert it in your answer booklet..
6. Attempt all the Questions.

SECTION A **MULTIPLE CHOICE** [30 MARKS]

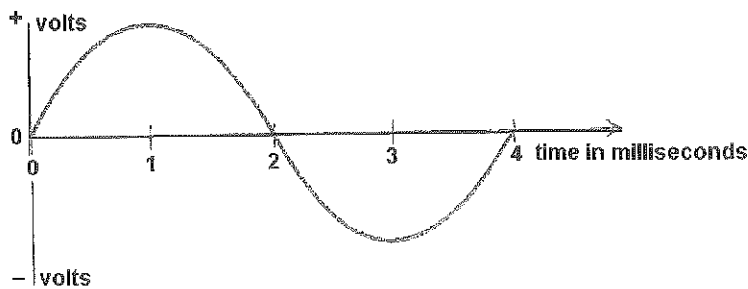
Circle the *letter* of the *best choice* in the *Answer Sheet* provided at the back of this question paper. Each question is worth 2 marks.

1. When the graph of current versus voltage is a straight line, the device is referred to as:
A. Active
B. Linear
C. Nonlinear
D. Bipolar

2. With what simple instrument can you measure the specific gravity of an electrolyte?
A. Hydrometer.
B. Voltmeter.
C. Anemometer-
D. Ammeter.

3. In a capacitive circuit, any increase in the value of the capacitor will cause
A. an increase in the value of the capacitive reactance
B. no change in the value of the capacitive reactance
C. the capacitor to heat up and fuse
D. a drop in the value of the capacitive reactance

4. The frequency of the waveform shown below is:



- A. 0.25 Hz
- B. 250 Hz
- C. 2Hz
- D. 4Hz

5. _____ is a renewable energy resource derived from the carbonaceous waste of various human and natural activities.

- A. Biomass
- B. Geothermal
- C. Hydropower
- D. wave energy

6. _____ is exposed to sunlight to generate energy for certain uses.

- A. Hydroelectric power
- B. Geothermal power
- C. Electrostatic forces
- D. Solar panels

7. For a *series* circuit, the _____ is used as a reference phasor.

- A. voltage
- B. current
- C. power
- D. inductor

8. The unit measurement for conductance is:

- A. Ohms
- B. Siemens.
- C. Henry.
- D. Amps.

9. In purely capacitive circuit connected to an alternating sinusoidal source:

- A. current leads voltage by 90°
- B. voltage leads current by 90°
- C. current lags voltage by 900
- D. voltage and current are in phase.

10. A device that converts mechanical into electrical energy is?

- A. solar cell
- B. thermocouple
- C. chemical cell
- D. generator

11. In an RL series circuit

- A. voltage lags current.
- B. current leads voltage.
- C. voltage leads current.
- D. voltage and current are in phase.

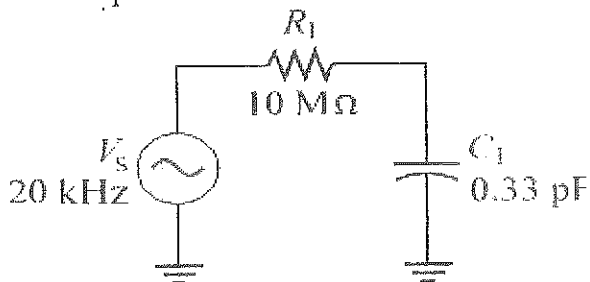
12. The component that forms the electrical connection between the rotating coil of wire in a motor and the external source of electrical energy is called the:

- A. rotor
- B. armature
- C. battery
- D. commutator

13. What form of energy is used to maintain an imbalance of charges between the terminals of a battery?

- A. Chemical energy
- B. Mechanical energy
- C. Electrical energy
- D. Solar energy

14. The impedance of the circuit shown below is:



- A. $24.1\text{ M}\Omega$
- B. $10\text{ M}\Omega$
- C. $26.1\text{ M}\Omega$
- D. 0Ω

15. The value of current or voltage after one time constant τ will be equal to:

- A. 36.8% of the final value
- B. 50% of the final value
- C. 63.2% of the final value
- D. 100% of the final value

SECTION B MATCHING & SHORT ANSWER QUESTIONS

[25 MARKS]

1. Match Column A with Column B

<u>Column A</u>	<u>Column B</u>
1. Carbon zinc cell	A. is the opposition to an alternating current caused by an inductor or capacitor.
2. Secondary cell	B. the opposition to current in an ac circuit caused by resistance and reactance.
3. Time constant	C. the measure of how susceptible an element is to the passage of current through it.
4. Capacitive reactance	D. is the number of cycles that occur in 1 second.
5. Impedance	E. a cell whose chemical action can be reversed.
6. Admittance	F. is one which posse's only inductance.
7. Conductance	G. is the time taken for a current or voltage in an RC or RL circuit to reach 63.2% of its final value.
8. Susceptance	H. is the reciprocal of impedance.
9. Pure inductor	I. Most common type of primary cell.
10. Frequency	J. is the opposition offered to the flow of alternating current through a perfect capacitor.
	K. is a measure of the 'willingness' of a material or circuit to allow current to flow through it.

2. Explain how energy is derived from the following renewable energy sources:

- a) Hydro power
 - b) Wind power
 - c) Solar power
 - d) Biomass energy
- (8 marks)

3. Draw the waveform of an alternating current and indicate all the parameters below:

- a) peak value,
 - b) peak-to-peak,
 - c) instantaneous value,
 - d) average value and the
 - e) RMS value.
- (5 marks)

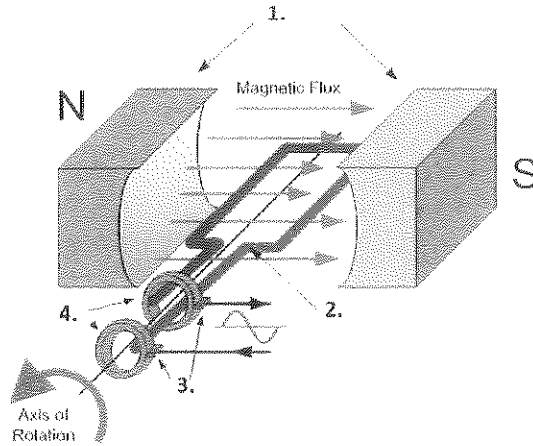
4. Give two Characteristics of a battery? (2 marks)

SECTION C DIAGRAMS AND OPERATIONS

[25 MARKS]

1. An alternator is an electromechanical device that converts mechanical energy to alternating current electrical energy. Using the diagram below, briefly explain how electricity is produced in an alternator and correctly label the parts marked 1 to 4.

(8 marks)



2. In any electrical machine such as the one shown above, what would be the part that you will have to keep spares for in stock and the reason why (it should be stocked)?

(2 marks)

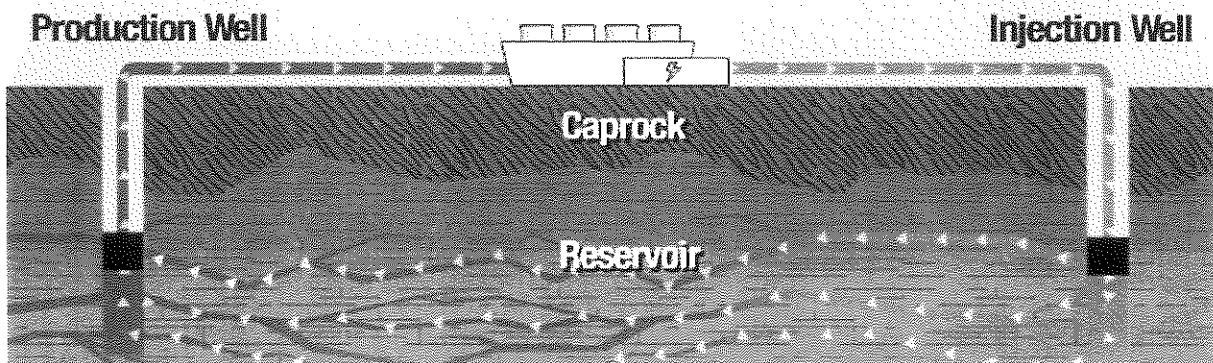
3. If the output voltage from an alternator such as the one above starts to fluctuate, what component or circuitry would you suspect to be faulty?

(2 marks)

4. Sketch the overview of a run of river hydropower system and list down its advantages.

(4 marks)

5. Name the type of renewable energy system shown below and briefly outline what is taking place:



(4 marks)

6. The alkaline cell is a development of the carbon-zinc cell. It has many advantages over the carbon-zinc cell, but is more expensive. Sketch the cross sectional diagram of an alkaline cell and label it correctly.

(5 marks)

SECTION D**CALCULATIONS****[20 MARKS]**

Show all necessary working where applicable.

1. An alternating voltage is represented by the expression $v = 35 \sin 314.2t$ volt.

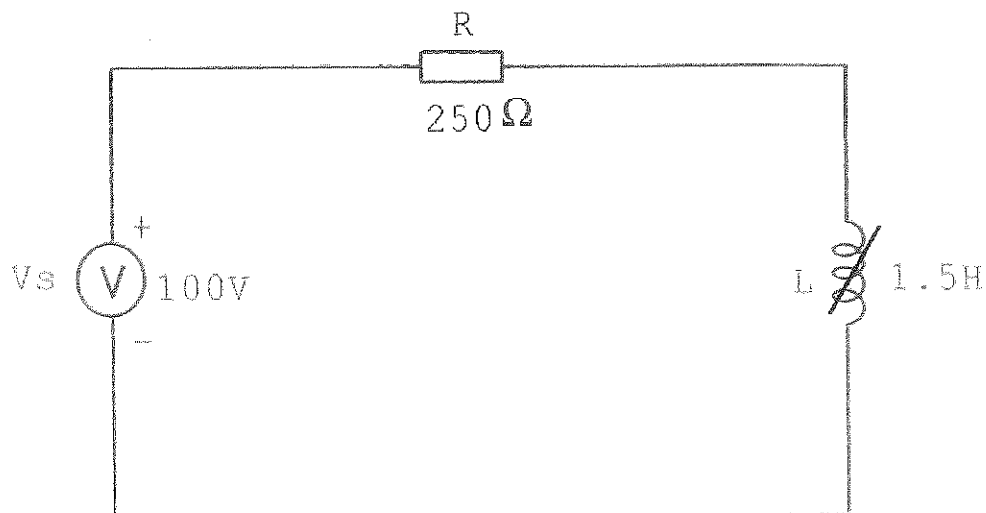
Determine the following:

- a) Maximum value, (2 mark)
- b) Frequency, (2 marks)
- c) Period of the waveform, and (2 marks)

2. As shown in the diagram below, a resistor of 250Ω is connected in series with a 1.5 H inductor, across a 100V , 50 Hz supply.

Calculate the:

- a) inductive reactance (2 mark)
- b) impedance (2 mark)
- c) current flowing in the circuit (2 mark)
- d) voltage drop across the resistor (2 mark)
- e) phase angle between the current and the applied voltage. (2 mark)
- f) if the inductance is increased to maximum in the circuit below, will the output voltage increase or decrease? (2 marks) What is the reason for your answer? (2 marks)



End of Examination