



**FNU** 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 IV 2017**

**DAY/DATE:** Thursday 5<sup>th</sup> October 2017

**TIME:** 09:00 – 11:10hrs

**ROOM:** TBA

### **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****TRUE OR FALSE****(10 MARKS)**

*In your answer sheet, write T if the statement is true or F if it is false. Each question is worth 1 mark.*

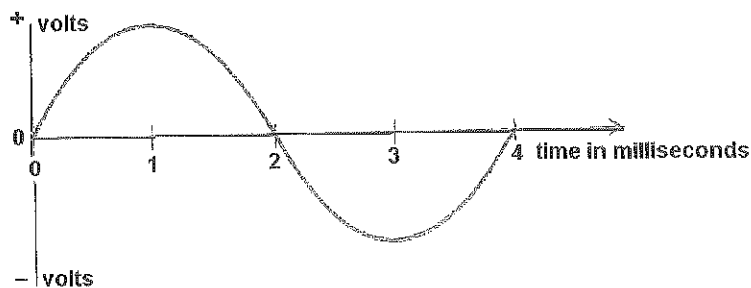
1. The terminals of a dry cell are made of carbon.
2. A primary cell can be recharged by a USB charger.
3. The current capacity is lower in an AA battery and more in a D size one.
4. Compared to a carbon-zinc cell, the alkaline cell has a longer service life.
5. The phasor diagram of a circuit indicates its loading capacity.
6. The measurement of admittance is also ohms.
7. Conductance is measured in siemens.
8. Susceptance is the expression of the readiness with which an electronic component, circuit, or system releases stored energy as the current and voltage fluctuate.
9. A geothermal well is a source of renewable energy in the form of steam.
10. A run of river hydro power layout is viable only where there is high head.

**SECTION B**      **MULTIPLE CHOICE**      [40 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 inductance 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  $90^\circ$
- B. voltage leads current by  $90^\circ$
- 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.

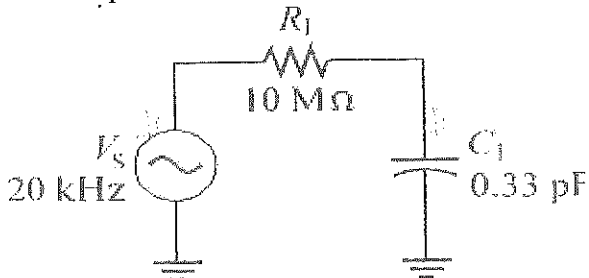
12. The component that forms the electrical connection between the rotating coil of wire in a motor and the external source of electrical energy is called the:

- 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. Electronical 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.  $0\Omega$

15. The value of current or voltage after one time constant  $\tau$  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

16. A 30 ohm resistance and a coil with inductance of 40 ohms are connected in series to a 100v 50Hz supply. What is the 'true power' for the circuit?

- A. 200 watts
- B. 120 watts
- C. 30 watts
- D. 140 watts.

17. If the measured current is found to be lagging the supply voltage, the circuit is:

- A. Resistive
- B. Lagging
- C. Capacitive
- D. Inductive.

18. How can the direction of rotation be changed on a single phase capacitor start induction motor?

- A. Swap the active and neutral lead connection to the motor
- B. Remove the start capacitor
- C. Reverse the connections of the start winding
- D. Reverse both the start and the run winding connections.

19. What is the effect of an inductive load on an AC supply?

- A. Unity power factor
- B. Lagging power factor
- C. Leading power factor
- D. Zero effect.

20. What is the main function of a fuse?

- A. to protect from electric shock
- B. to protect circuit conductors from damage
- C. to reduce electricity bills
- D. to reduce start up currents of appliances.

**SECTION C MATCHING**

**[10 MARKS]**

1. Match Column A with Column B

**Column A**

1. Carbon zinc cell
2. Secondary cell
3. Time constant
4. Capacitive reactance
5. Impedance
6. Admittance
7. Conductance
8. Susceptance
9. Pure inductor
10. Frequency

**Column B**

- A. is the opposition to an alternating current caused by an inductor or capacitor.
- B. the opposition to current in an ac circuit caused by resistance and reactance.
- C. the measure of how susceptible an element is to the passage of current through it.
- D. is the number of cycles that occur in 1 second..
- E. a cell whose chemical action can be reversed.
- F. is one which posse's only inductance.
- G. is the time taken for a current or voltage in an RC or RL circuit to reach 63.2% of its final value.
- H. is the reciprocal of impedance.
- I. Most common type of primary cell.
- 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.

**SECTION D – SHORT ANSWERS**

**20 MARKS**

1. Give two Characteristics of a battery? (1 mark)

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

- a) peak value,
- b) peak-to-peak,
- c) average value and the
- d) RMS value. (4 marks)

3. Using appropriate diagrams, explain how energy is derived from the following renewable energy sources:

- a) Hydro power
- b) Wind power
- c) Solar power

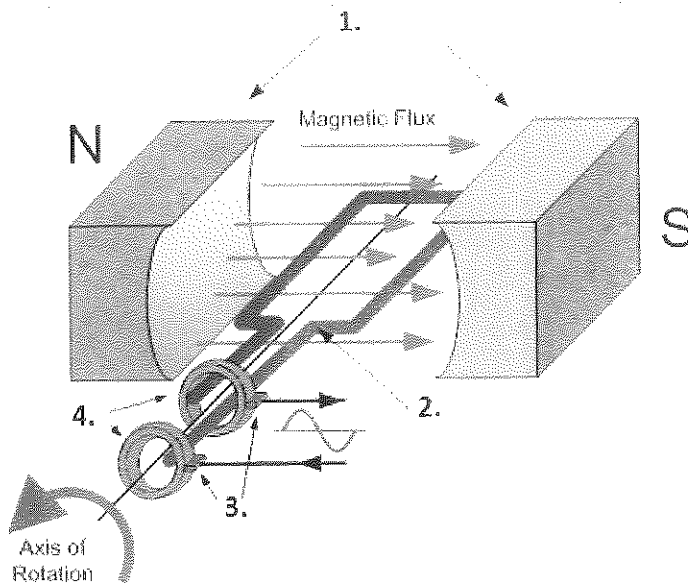
(5 marks each)



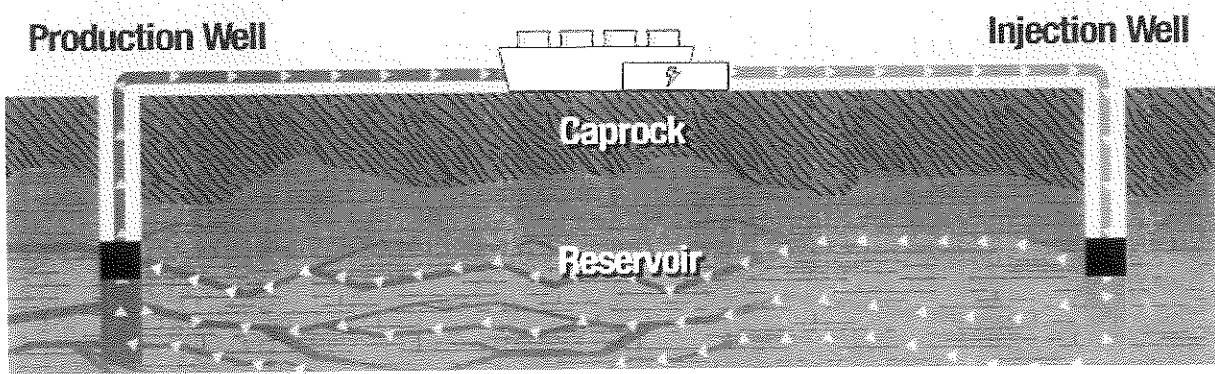
SECTION E      DIAGRAMS AND OPERATIONS

[10 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. (4 marks)



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



(3 marks)

3. 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 show the two electrodes and the electrolyte correctly in the diagram.

(3 marks)

**SECTION F**

**CALCULATIONS**

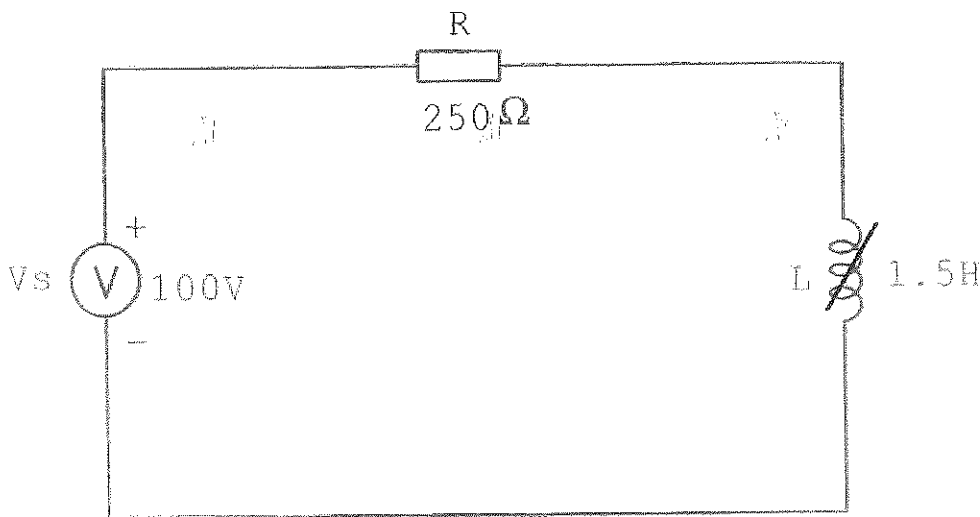
**[10 MARKS]**

*Show all necessary working where applicable.*

1. As shown in the diagram below, a resistor of  $250\Omega$  is connected in series with a  $1.5\text{ H}$  inductor, across a  $100\text{V}$ ,  $50\text{ Hz}$  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? (3 marks)



**End of Examination**