

**SCHOOL OF ELECTRICAL & ELECTRONIC ENGINEERING**

CERTIFICATE IV IN ELECTRONIC ENGINEERING STAGE 2

UNIT CODE: **EEE307** UNIT TITLE: **ELECTRICAL PRINCIPLES IB**

**FINAL EXAMINATION - PENSTER 4 2013**

**DAY/DATE:** Wed/19/10/13

**TIME:** 09:00-11:10

**ROOM:** Jai Narayan College

**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.

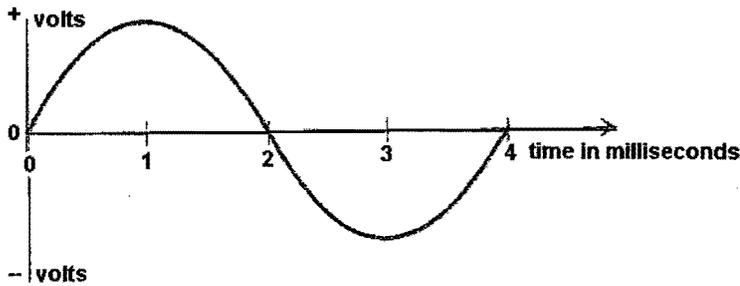
SECTION A      MULTIPLE CHOICE      [30 MARKS ]

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 each.

1. What are the three main components of an electric cell?
  - A. Carbon zinc cell, electrolyte and ammonium chloride.
  - B. Positive electrode, negative electrode and electrolyte.
  - C. Lead-acid cell, zinc chloride and negative electrode.
  - D. Ammonium chloride, zinc chloride and electrolyte.
  
2. How many NiCad cells are needed to get a battery voltage of 7.2V?
  - A. 4
  - B. 5
  - C. 6
  - D. 7
  
3. With what simple instrument can you measure the specific gravity of an electrolyte?
  - A. Hydrometer.
  - B. Voltmeter.
  - C. Anemometer-.
  - D. Ammeter.
  
4. Which of the following is the *smallest* domestic battery?
  - A. Size D
  - B. Size C
  - C. Size AA
  - D. Size AAA
  
5. The form factor of a sinusoidal waveform is:
  - A 1.11
  - B. 1.414
  - C. 0.707
  - D. 0.637
  
6. Generation of power from earth's stream is known as:
  - A Nuclear power
  - B. Hydroelectric power
  - C. Geothermal power
  - D. None of the above

**SECTION A**      **Continued.**

7. The frequency of the waveform shown below is:



- A. 0.25 Hz
  - B. 250 Hz
  - C. 2Hz
  - D. 4Hz
8. In a purely resistive circuit connected to an alternating sinusoidal source:
- A. Voltage leads current by 90 degrees.
  - B. Current leads voltage by 90 degrees.
  - C. Voltage lags current by 90 degrees.
  - D. Voltage and current are in phase.
9. \_\_\_\_\_ 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
10. What value of inductance has an inductive reactance of 60 ohm at a frequency of 1 kHz?
- A. 0.0075 H
  - B. 0.0095 H
  - C. 0.0036 H
  - D. 0.0071 H
11. \_\_\_\_\_ is exposed to sunlight to generate energy for certain uses.
- A. Hydroelectric power
  - B. Geothermal power
  - C. Electrostatic forces
  - D. Solar panels

**SECTION A**

**Continued.**

12. The waveform of  $v = 25 \sin(100\pi t + 15^\circ)$  clearly tells us that this waveform is:
- A. Leading the graph of  $v = 25 \sin(100\pi t)$  by  $15^\circ$ .
  - B. Lagging the graph of  $v = 25 \sin(100\pi t)$  by  $15^\circ$ .
  - C. In phase with the graph of  $v = 25 \sin(100\pi t)$ .
  - D. Out of phase by  $90^\circ$ .
13. For a *series* circuit, the \_\_\_\_\_ is used as a reference phasor.
- A. voltage
  - B. current
  - C. power
  - D. inductor
14. The admittance,  $Y = G + jB$ . What does B stands for?
- A. Impedance
  - B. Conductance
  - C. Base
  - D. Susceptance
15. The unit measurement for conductance is:
- A. Ohms
  - B. Siemens.
  - C. Henry.
  - D. Amps.

**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. Sketch the *waveform* to show the relationship for the current and voltage of a sinusoidal waveform across:

- a resistor,
  - a pure inductor and
  - a pure capacitor
- (6 marks)

3. Draw the AC waveform and indicate all the parameters: peak value, peak-to-peak, instantaneous value, average value and the RMS value. (4½ marks)

4. What value of current can a 6Ah battery supply for 10 hours, if this rating is for a C/10 discharge current? (1½ marks)

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

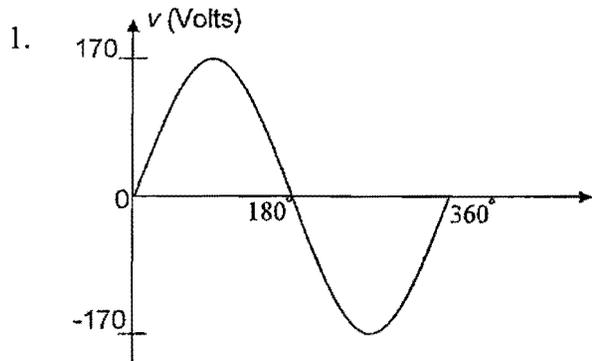
6. What is meant by the 'end-point ' voltage of a battery? (1 mark)

## SECTION C

## CALCULATIONS

[45 MARKS]

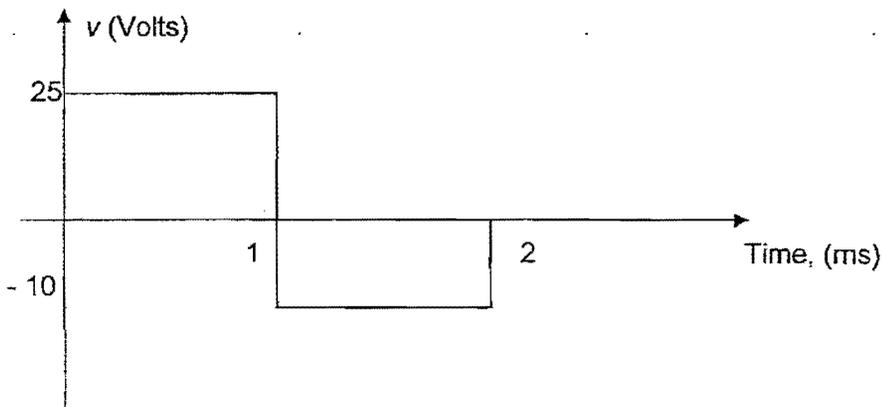
Show all necessary working where applicable.



Calculate the following for the sine wave shown above:

- instantaneous values at  $75^\circ$  (2 marks)
- average value for one cycle. (1 mark)
- average value for negative half of the sine wave. (2 marks)
- rms voltage (2 marks)

2. Calculate the *average* and *rms values* of the waveform given below:



3. An  $8\text{pF}$  capacitor is connected in series with a  $0.5\text{M}\Omega$  resistor across a  $200\text{V}$  dc supply. Calculate the:

- time constant (2 marks)
- initial charging current (2 marks)
- time taken for the p.d. across the capacitor to grow  $160\text{V}$ . (2 marks)
- current and the p.d. across the capacitor  $4.0\text{s}$  after it is connected to the supply (3 marks)

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

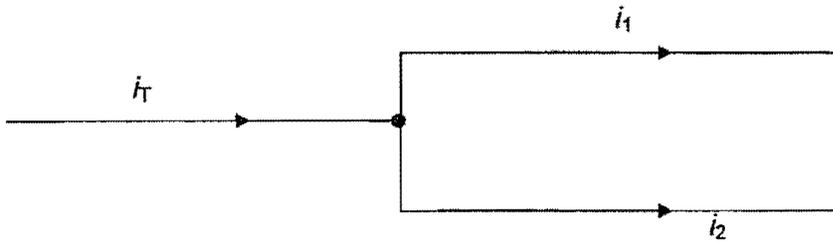
Determine the following:

- Maximum value, (1 mark)
- Frequency, (2 marks)
- Period of the waveform, and (2 marks)
- The value  $3.5\text{ms}$  after it passes through zero, going positive. (2 marks)

5. From the circuit given below we have:

$$i_1 = 12 \sin(0.1t - 90^\circ)$$

$$i_T = 34 \sin(0.1t - 45^\circ)$$

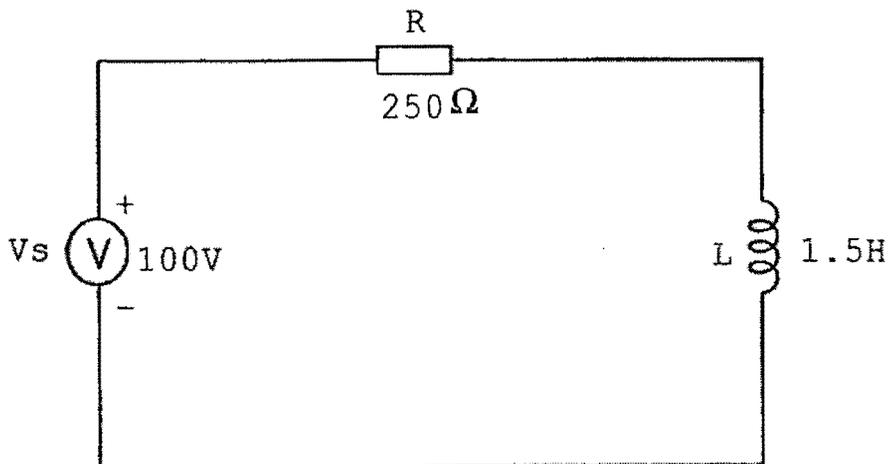


Determine the following:

- The representation of the current as a phasor domain expression for  $i_2$ . (4 marks)
- $i_2$  using rectangular form. (4 marks)
- the expression in part (b) as in phasor domain form. (2 marks)
- the expression in part (c) as time domain. (2 marks)

6. 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:

- inductive reactance (1 mark)
- impedance (1 mark)
- current flowing in the circuit (1 mark)
- voltage drop across the resistor (1 mark)
- phase angle between the current and the applied voltage. (1 mark)



**End of Examination**