MASENO UNIVERSITY

UNIVERSITY EXAMINATIONS 2017/2018

FIRST YEAR FIRST SEMESTER EXAMINATIONS FOR THE DEGREE OF BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY

MAIN CAMPUS

CIT 105: ELECTRICAL PRINCIPLES

Date: 19th February, 2018 Time: 12.00 - 3.00 pm

INSTRUCTIONS:

- Answer ALL questions in SECTION A and any other TWO from SECTION B
- Write your registration number on all sheets of the answer book used.
- Use a NEW PAGE FOR EVERY QUESTION attempted, and indicate number on the space provided on the page of the answer sheet.

SECTION A (30 MARKS)
ANSWER ALL QUESTIONS IN THIS SECTION: EACH QUESTION CARRIES 1 MARK, UNLESS OTHERWISE INDICATED

1. How many coulombs of charge flows through a circuit carrying 5 A in 5 min?
   A.1500 B.150 C.15 D.1

2. Alternating current is found most suitable for
   A.arc welding B.resistance welding C.gas welding D.electric arc welding.

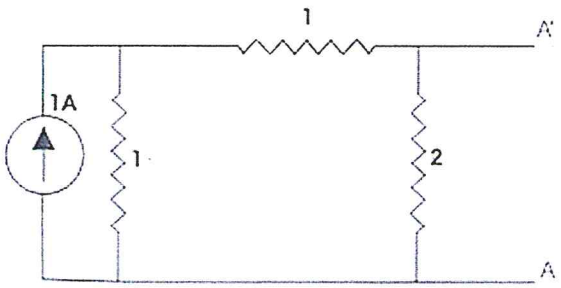
3. Five coulomb of electrical charge is contributed by how many electrons?
   A. 3.125 × 1019. B.1.6 × 1019 C.1019 D.1.6 × 1012

4. On which factors does the severity of electric shock depends?
   A. Only on pathway through the body.
   B. Only on the type of supply ac/dc.
   C. Only on magnitude of voltage.
   D. All of above.

5. For carrying an current of 75 A an aluminium conductor should have a minimum cross-section of
   A.25 mm B.10 mm C.15 mm D.20 mm

6. A copper conductor of one square millimeter can safely carry a current of
   A.100 A. B.50 A. C.25 A. D.10 A.

7. In the figure shown, what will be the current passing through 2 Ω resistor?



   A.0.25 A B.0.75 A C.0.5 A D.1 A

8. Ampere - second is the unit of
   A.conductance. B.power. C.energy. D.charge.

9. An current of 6 A is same as
   A.6 Joule / second.
   B.6 Coulomb / second.
   C.6 Watt / second.
   D.none of the above.

10. When an iron piece is placed in a magnetic field,
    A. The magnetic lines of force will bend away from their usual paths in order to go away from the piece
    B. The magnetic lines of force will bend away from their usual paths in order to pass through the piece
    C. The magnetic field will not be affected
    D. The iron piece will break

11. How should a fuse be installed in a circuit to insure proper operation?
A. parallel to the load
B. series with the load
C. in any way possible
D. at the ground point

12. Which of the following devices can be used to test the windings of an inductor for continuity?
A. wattmeter
B. voltmeter
C. ohmmeter
D. Wheatstone bridge

13. The Henry is the unit of measurement for which of the following properties?
A. reactance
B. capacitance
C. resistance
D. induction

14. When using a standard multimeter to measure AC voltage, what type of measurement will the multimeter indicate?
A. peak-to-peak
B. peak
C. average
D. rms

15. Which of the following determines total power in a series circuit?
A. source voltage times the current
B. total voltage applied to the circuit
C. current flowing through a switch
D. average of the wattage consumed by each resistor

16. If a resistor suddenly decreases in value (resistance decreases), what will happen to the current through the resistor?
A. increases
B. remains unchanged
C. decreases
D. fluctuates

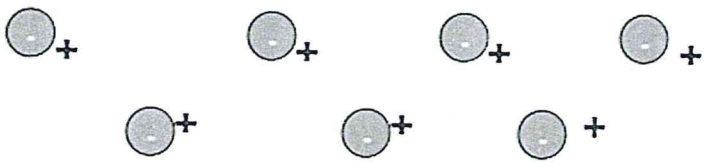
17. Which of the following circuit configurations has the same amount of voltage drop across each of its components?
A. parallel
B. series-parallel
C. series
D. combination

18. As temperature increases, what happens to the current-carrying ability of a wire?
A. There is no change.
B. The wire can carry more current.
C. The wire can carry less current.
D. The wire can carry no current.

19. What should be observed when connecting a voltmeter into a DC circuit?
A. rms
B. resistance
C. polarity
D. power factor

20. An electro-mechanical energy conversion device is one which converts _____
a) Electrical energy to mechanical energy only
b) Mechanical energy to electrical energy only
c) All of the mentioned
d) None of the mentioned

21. Conductors and insulators can be modeled in diagrams that show how electrons respond to voltage.



This diagram illustrates …
A. a non-resistant material with voltage applied

B. an insulator material with voltage applied
C. a conductor with no voltage applied
D. a conductor with voltage applied

Identify the Electricity RULE not being observed in each of the next three scenarios in question 22, 23 and 24.

22. "The problem with this computer game", said Matt, "is that the power bar keeps popping its circuit. I think that I need a better power bar, so I can play my game without interruption."
    A. Don't use electricity near water
    B. Improper or unsafe equipment
    C. Keep a safe distance high voltage
    D. Don't use more electricity than recommended

23. While sitting at his desk, Albert was playing with the electric cord to the stereo. The little bits of plastic he was able to rub off exposed the copper wire, giving him a shock.
    A. Don't use electricity near water
    B. Improper or unsafe equipment
    C. Keep a safe distance high voltage
    D. Don't use more electricity than recommended

24. Mr. Jones was cutting his lawn with his new electric lawn mower. He even continued, when it started to rain, because this model was able to pick up wet clippings with ease
    A. Don't use electricity near water
    B. Improper or unsafe equipment
    C. Keep a safe distance high voltage
    D. Don't use more electricity than recommended

25. Garbage is another source of fuel used to generate electrical energy. The particular type of garbage used is called …
    A. bio-sludge B. biomass C. bio-matter D. bioaccumulation

26. By-products, from the generation of electrical energy, can be harmful to living organisms and to the environment. One such by-product reacts with water to produce ACID RAIN. The chemical that does this is …
    A. sulfur dioxide B. nitrogen oxide C. carbon dioxide D. sulfuric oxide

27. There are many advantages to improving electrical technologies. Saving time, space and speed are just a few. However, one drawback of electrical technology advancement is …
    A. convenience B. sustainability C. expense D. independence

28. Access to technology has become an issue because some countries
    A. are too poor to get wired
    B. do not have the expertise to get involved
    C. have too many 'hackers' who interfere
    D. have unrestrictive laws enabling anyone to do what they want

29. A fuse and a circuit breaker interrupt a circuit when there is too much current flowing. The disadvantage of the fuse is that it …
    A. can be easily repaired
    B. has to be replaced when it works

C. doesn't work on really small overloaded circuits
D. can be used over and over – taking a long time to wear out

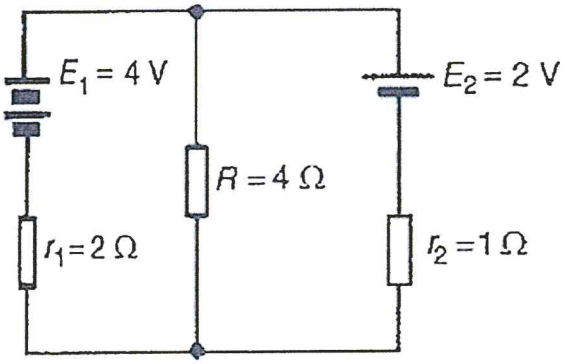
30. Solutions can also be resistors. The more charged particles in a solution,
A. the more molecules it has
B. the more resistance it has
C. the less resistance it has
D. the fewer molecules it has

SECTION B
ATTEMPT ANY TWO QUESTIONS

QUESTION 2

a) With regard to magnetism, explain what is meant by the terms 'permeability' and 'relative permeability'. [5 Marks]

b) The figure shows a circuit containing two sources of e.m.f., each with their internal resistance. Determine the current in each branch of the network by using the superposition theorem. (9 Marks)



c) With reference to the magnetisation of an iron core, draw a typical B-H curve. [6 Marks]

QUESTION 3

a) How are cables represented in a computer motherboard? [2 marks]

b) A coil has 300 turns and an inductance of 4.5 mH. How many turns would be needed to produce a 0.72mH coil assuming the same core is used? [3 Marks]

c) A steady current of 5A when flowing in a coil of 1000 turns produces a magnetic flux of 500 μWb. Calculate the inductance of the coil. The current of 5A is then reversed in 12.5 ms. Calculate the e.m.f. induced in the coil. [4 marks]

d) The main effects of electrical current include **magnetic effect, chemical effect and heating effect**: Give at least two practical applications of each of these effects: (6 Marks)

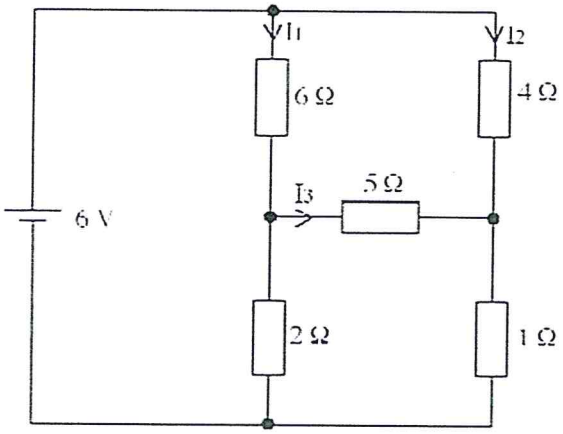
e) Explain the most important function that batteries perform in computing devices, without which these devices would not operate. [2 marks]

f) Differentiate between Line Voltage and Phase Voltage as far as Alternating Voltages are concerned.(3 Marks)

QUESTION 4

c) With regard to magnetism, explain what is meant by the terms 'permeability' and 'relative permeability'. [5 Marks]

d) Using either the mesh or node analysis method, determine the values of I1, I2, I3 for the circuit shown in the following diagram: [5 Marks]



(a) With reference to the magnetisation of an iron core, draw a typical B-H curve. [5 Marks]
(b) Explain the shape of the curve in part (a), with particular reference to the term 'hysteresis'. [5 Marks]
(c) Give an 'everyday' example of the application of hysteresis, other than in relation to magnetism.

QUESTION 5

a) How are cables represented in a computer motherboard? [2 marks]
b) Give any three applications where analogues meters deemed convenient and safer to use? [3 marks]
c) Define the term loading effect [2 marks]
d) What is the difference between renewable and non-renewable energy sources? [2 marks]
e) What harmful by-products result from electrical generation and how do they affect the environment? [4marks]
f) What does sustainability mean? [2 marks]
g) Describe alternative sources of energy and give three examples of such. [3 marks]
h) Explain the most important function that batteries perform in computing devices, without which these devices would not operate. [2 marks]