



**SCHOOL OF ELECTRICAL AND ELECTRONIC  
ENGINEERING**

**CERTIFICATE IV IN ELECTRICAL ENGINEERING – STAGE 1**

**EEE325-CRAFT SCIENCE**

**FINAL EXAMINATION PAPER – 2013**

**DAY/DATE: \_\_\_\_\_ TIME: \_\_\_\_\_ ROOM: \_\_\_\_\_**

**INSTRUCTIONS TO STUDENTS:**

1. You are allowed 10 minutes extra reading time during which you are not allowed to write.
2. Begin each **SECTION** on a fresh page and use both sides of the sheet.
3. Write your candidate number at the top of each answer sheet.
4. Insert all foolscaps, graph paper, drawing paper etc in their correct sequence and secure with string.
5. For all sheets of paper on which rough / draft work has been done, cross it through and you must attach to the answer booklet.
6. Write clearly the number(s) of the question(s) attempted on top of each sheet.
7. **ATTEMPT ALL QUESTIONS**
8. Show all workings where necessary.
9. Programmable calculators are not allowed.

**SECTION A** (20 MARKS)

In each of the following statements one of the suggested answers is correct. Write the identifying letters beside the question numbering in your answer sheet.

**MULTIPLE CHOICE**

1. \_\_\_\_\_ is composed of molecules and atoms.
  - a. atom
  - b. element
  - c. molecule
  - d. matter
  
2. Under normal conditions the number of electrons and the number of protons are:
  - a. greater electrons
  - b. greater protons
  - c. no protons
  - d. equal
  
3. In any particular atom, the actual number of positive charges is equal to the:
  - a. atomic number
  - b. number of electrons
  - c. number of protons
  - d. neutrons
  
4. Electric current is the flow of:
  - a. protons
  - b. neutrons
  - c. electrons
  - d. nucleus
  
5. The atoms in a \_\_\_\_\_ more readily move in relation to one another and vibrate at a speed dependent on temperature:
  - a. molecule
  - b. solids
  - c. liquids
  - d. gas
  
6. A measure of ease with which electrical current may flow through a material is known as:
  - a. conductivity
  - b. resistivity
  - c. conductor
  - d. insulator

7. The ability of a material to transmit heat by conduction is known as:
- thermal conductivity
  - conduction
  - radiation
  - specific heat capacity.
8. The degree of magnetism in magnetically soft materials is:
- does not change
  - easily changed
  - always same
  - never same
9. The property of any material by which it opposes the flow of electric current is known as:
- voltage
  - capacitance
  - inductance
  - resistance
10. Any good conductor would have large numbers of:
- conduction
  - resistivity
  - protons
  - free electrons
11. The rate of change in velocity is known as:
- speed
  - acceleration
  - density
  - pressure
12. The ability of a material to suffer indentation or penetration without fracture is known as:
- brittleness
  - ductility
  - softness
  - hardness
13. \_\_\_\_\_ contains very few or no free electrons.
- conductors
  - insulators
  - semi conductors
  - All of the above

14. The best conductors of heat are:
- liquids
  - gases
  - plastics
  - metals
15. \_\_\_\_\_ is the term used to denote the effect of a force producing or tending to produce rotation of a body about a point.
- friction
  - torque
  - tenacity
  - work
16. Which of the following metal burns readily with a dazzling flame when heated ?
- iron
  - silver
  - mercury
  - magnesium
17. The ratio of the power output to the power input as a percentage is:
- machine loss
  - power input
  - power output
  - efficiency
18. A tension is a force that tends to:
- decrease the length of an object
  - increase the length of an object
  - stretch an object
  - move an object forwards
19. The three main types of forces of friction are:
- stretching, pulling and rubbing friction
  - sliding, slipping and rolling friction
  - fluid, stretching and pulling friction
  - sliding, rolling and fluid
20. In any open circuit there is:
- current flow
  - no current flow
  - no power
  - All of the above

**SECTION B**                      **(10 MARKS)**

Write down the question numbers in your answer booklet and beside it write the word(s) that best completes the statement.

- A. Conductors have -----1-----to electricity, while insulators have -----2-----.
- B. Electrical power is measured in -----3-----and electrical energy is measured in -----4-----.
- C. Pure semi-conductors are -----5----- at low temperature and -----6-----good conductors at high temperatures.
- D. Causes of rusting are -----7-----and -----8-----coming in contact with the iron.
- E. The term oxidation is generally used to describe the ----9----- of-----10----- to a substance.

**SECTION C**                      **(30 MARKS)**

1. Define the following:
- Dielectric Strength
  - Resistivity
  - Temperature co-efficient of resistance
- (3 Marks)
2. Outline four basic principles of fluid statics. (4 Marks)
3. List three characteristics of ionic compound AND three characteristics of covalent compound. (6 Marks)
4. Name three (3) insulators and three (3) conductors used in the electrical industry. (6 Marks)
5. Outline four factors that affect the resistance of a conductor AND also explain their relationship with reference to resistance. (4 Marks)
6. List three (3) ways in which friction is used to advantage in the workshops. (3 Marks)
7. Outline the reactions and explain the changes that take place when sodium is heated strongly in a blow pipe flame. (4 Marks)

**SECTION D****(40 MARKS)**

1. A force of 110N is required to move a box 6.2m along a horizontal surface in 10 seconds. Calculate the amount of work done and the power used.  
(3 marks)
  2. Three forces acting at a point are spaced  $120^\circ$  apart from each other.  $F_1 = 35\text{N}$ ,  $F_2 = 55\text{ N}$  and  $F_3 = 65\text{ N}$ , find the resultant force acting at a point.  
(6 marks)
  3. A water tank of 2.0 m diameter contains 5 m depth of water. What is the pressure exerted by the water on the base of the tank? ( $\rho = 1000\text{kg/m}^3$ )  
(2 marks)
  4. The field windings of a generator has a resistance of  $145\ \Omega$  at a temperature of  $20^\circ\text{C}$ . What will be the resistance of the windings when the machine temperature rises on full load to  $80^\circ\text{C}$ ? ( $\alpha_0 = 0.00427$ )  
(4 marks)
  5. How many units of heat energy are created by a  $49\ \Omega$  resistor connected to a 240 V supply if the supply is left switched on for one hour 10 minutes?  
(4 marks)
  6. A man throws a cylinder into the sea. The cylinder goes down 15 m under the sea level and stays there.
    - a. Find the pressure at this level if density of sea water is  $1025\text{kg/cubic meters}$ .  
(3 marks)
    - b. Find the force exerted by sea water on the surface of the cylinder which has a diameter of 10cm.  
(3 marks)
  7. An equipment consists of a motor that uses 1 KW of power and a lamp. If the equipment voltage is 240 volts and the current drawn is 3.75 amperes calculate the rating of the lamps in watts.  
(2 marks)
  8. A 4 KW electric motor is operating at 960 rpm. Calculate the:
    - a. torque exerted
    - b. efficiency of the motor if the losses were 257 W.  
(6 marks)
  9. A certain marble landmark has a mass of 3.2 tonnes (3200 kg) cools down from  $60^\circ\text{C}$  to  $30^\circ\text{C}$  and in doing so gives out 2 mega joules of heat. What is the specific heat of this marble?  
(4 marks)
  10. A body of mass 85 kg lies on a horizontal surface. Find the work done in sliding this body for a distance of 20 m over the surface if the coefficient of friction between the surfaces in contact is 0.15.  
(3 marks)
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**End of question paper**