



## **SCHOOL OF ELECTRICAL AND ELECTRONIC ENGINEERING**

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

**EEE325-CRAFT SCIENCE**  
**FINAL EXAMINATION PAPER – 2015**

**DAY/DATE: THURSDAY / 30/07/15    TIME: 9.00-11.10AM    ROOM: HALL**

### **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. The smallest particle into which a compound can be divided and still retain the characteristics of the compound is called:
  - a. atom
  - b. element
  - c. molecule
  - d. matter
  
2. When substances are intermingled without being chemically combined they form:
  - a. elements
  - b. chemical
  - c. matter
  - d. mixtures
  
3. Most organic compounds do not dissolve in:
  - a. water
  - b. mixtures
  - c. solutions
  - d. alcohol
  
4. One characteristic of metals is that it has:
  - a. tendency to gain or share electrons
  - b. gas
  - c. tendency to lose electrons
  - d. all of the above
  
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. Materials such as sand rocks, gravels, metals clays and ceramics are known as:
  - a. Inorganic materials
  - b. Organic materials
  - c. ceramics
  - d. insulator

7. In dead mild steel the carbon content is deliberately kept as low as possible so that the steel will have:
- high ductility
  - high strength
  - more resistance
  - greater capacity.
8. Brass alloys are alloys of:
- copper and tin
  - copper and zinc
  - tin and zinc
  - all of the above
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. The area under the velocity –time graph gives:
- acceleration
  - average speed
  - time spent
  - distance covered
17. The ratio of the power output to the power input as a percentage is:
- machine loss
  - power input
  - power output
  - efficiency
18. The rate of change of velocity is known as:
- gravity
  - velocity
  - acceleration
  - motion
19. The density of a liquid is defined as its:
- distance per time
  - volume per weight
  - mass per unit area
  - mass per unit volume.
20. Pressure within a body of liquid depends upon two factors:
- distance and depth
  - density and depth
  - voltage and current
  - type of material and density

**SECTION B**

**MATCHING**

**( 10 MARKS)**

**Match Column A with Column B**

Write down the correct identifying alphabet of column B alongside the numbers of column A

**Column A**

1. Primary cell
2. Secondary cell
3. Inductive reactance
4. Capacitive reactance
5. R-L
6. Specific gravity
7. Internal resistance
8. R-C
9. Time constant
10. Phase angle

**Column B**

- A. is a measure of how heavy the liquid is compared to water.
- B. circuit, the voltage leads the current by  $\phi$ .
- C. will explain, why the no-load voltage of a battery is higher than its loaded value.
- D. is the phase difference between two waveform.
- E. a cell whose chemical action can be reversed.
- F. is the time taken for a current or voltage to reach 63.2% of its final value.
- G. is the opposition to alternating current caused by the back emf of the coil by a perfect inductor .
- H. circuit, the current leads the voltage by  $\phi$ .
- I. a cell that can't be charged.
- J. is the opposition offered to the flow of alternating current through a perfect capacitor.

**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 FOUR (4) insulators and their specific applications 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. List down the four (4) different types of ceramics.  
(4 Marks)

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

1. 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)
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 1.5 m diameter contains 3 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  $240 \text{ V}$  supply if the supply is left switched on for one hour 10 minutes?
- (4 marks)
6. During a research project deep sea photographs were made at a depth of  $7.2$  kilometers. (Density of sea water is  $1025\text{kg/m}^3$ ). Calculate the:
- a) Pressure at this depth (2 marks)
- b) force on the plane surface of the window of the camera enclosure that measured  $0.12 \times 0.12$
- (3 marks)
7. An equipment consists of a motor that uses  $1 \text{ KW}$  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.
- (3 marks)
8. A  $4 \text{ KW}$  electric motor is operating at  $1440\text{rpm}$ . Calculate the:
- a. torque exerted
- b. The efficiency of the motor if the losses were  $325\text{W}$ .
- (6 marks)
9. A certain marble landmark has a mass of  $2.8$  tonnes ( $2800 \text{ kg}$ ) cools down from  $50^{\circ}\text{C}$  to  $30^{\circ}\text{C}$  and in doing so gives out  $1.5$  mega joules of heat. What is the specific heat of this marble?
- (4 marks)
10. A force of  $110\text{N}$  is required to move a box  $6.2\text{m}$  along a horizontal surface in  $10$  seconds. Calculate the amount of work done and the power used.
- (3 marks)

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**The End**

