



**COLLEGE: COLLEGE OF ENGINEERING, SCIENCE & TECHNOLOGY  
(CEST)**

**SCHOOL: ELECTRICAL & ELECTRONICS ENGINEERING**

**PROGRAMME: CERTIFICATE IV IN ELECTRICAL ENGINEERING-STAGE 1**

**UNIT CODE: EEE325**

**TITLE: CRAFT SCIENCE FOR ELECTRICIANS**

**FINAL EXAMINATION – PENSTER 1, 2017**

**TIME: 2 HOURS 10 MINUTES**

**DAY/DATE: TBC/ TBC TIME: TBC ROOM: TBC**

**INSTRUCTIONS TO STUDENTS**

1. You are allowed **10 minutes Extra reading time** during which you are **NOT** 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 attached sheet.
4. Insert all written foolscaps, graph paper, drawing paper, etc. in their correct sequence and secure with string.
5. For all sheets of paper on which rough or draft work has been done, cross it through and you **MUST ATTACH** to your answer scripts.
6. Write clearly the number(s) of the question(s) attempted on the top of each sheet.
7. Answers to all questions must be written in **INK** on the Answer sheet provided and show all working where necessary.
8. Only Non-programmable calculators are allowed.
9. **ATTEMPT** all questions.

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. Pressure within a body of liquid depends upon two factors:
- distance and depth
  - density and depth
  - voltage and current
  - type of material and density
20. The density of a liquid is defined as its:
- distance per time
  - volume per weight
  - mass per unit area
  - mass per unit volume.

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

- A. The ability of a material to be drawn out to a small cross section.
- B. neither has definite volume nor shape.
- C. the addition of oxygen to a substance.
- D. ability of an insulating material to withstand physical breakdown.
- E. slowing down of an object.
- F. friction and windage
- G. composed of molecules
- H. inorganic materials e.g. porcelain high voltage insulators
- I. Heterogeneous and homogeneous.
- J. is the rate of doing work.

Column B

- 1. Power
- 2. Mixtures
- 3. Ceramics
- 4. Ductility
- 5. Gas
- 6. Oxidation
- 7. Di-electric strength
- 8. Deceleration
- 9. Covalent compound
- 10. Losses in a machine

**SECTION C**

**(30 MARKS)**

1. Define the following:
  - Mixtures
  - Resistivity
  - Force(3 Marks)
2. Outline four FACTORS affecting the resistance of a conductor. (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 Physical properties of materials. (4 Marks)
6. What are the three (3) factors which governs the rate of corrosion? (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. (4 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? ( $\rho = 1000\text{kg/m}^3$ ) (3 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  $30^{\circ}\text{C}$ ? ( $\alpha_0 = 0.00427$ ) (5 marks)
5. A missile is fired vertically with an initial velocity of  $400\text{m/s}$ . It is acted on by Gravity. Calculate the height it reaches, time taken to go up and come down. (5 marks)
6. A car travels around a circular track of radius  $40\text{m}$  at a velocity of  $8\text{m/s}$ . Calculate its angular velocity. (3 marks)
7. The pressure of gas contained in a cylinder with a movable piston is  $300\text{Pa}$ . The area of the piston is  $0.5 \text{ m}^2$ . Calculate the force that is exerted on the piston. (3marks)
8. A swimming pool of width  $9.0 \text{ m}$  and length  $24.0 \text{ m}$  is filled with water to a depth of  $3.0 \text{ m}$ .  
Calculate pressure on the bottom of the pool due to the water. (4 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**