



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

SCHOOL: SCHOOL OF ELECTRICAL & ELECTRONICS ENGINEERING

PROGRAMME: CERTIFICATE III/IV IN ELECTRICAL ENGINEERING-STAGE 2

UNIT CODE: EEC326

TITLE: MATERIAL SCIENCE for TRADE

FINAL EXAMINATION – QUARTER 2, 2019

**ROOM: AS PER TIMETABLE
TIME: 2 HOURS 10 MINUTES**

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 a string.
5. For all sheets of paper on which rough/draft work has been done, cross it through and ATTACH these to your answer scripts.
6. Write clearly the number(s) of the question(s) attempted on the top of each sheet.
7. Use of programmable calculator(s) is prohibited.
8. **ANSWER ALL QUESTIONS**
9. Show all working where necessary.
10. **ALWAYS CHECK YOUR WORK BEFORE YOU LEAVE THE EXAM ROOM.**

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. A _____ is an instrument that uses a column of liquid to measure pressure..
 - a. voltmeter
 - b. ammeter
 - c. manometer
 - d. galvanometer

2. The number of electrons in the outermost shell of copper is:
 - a. four
 - b. three
 - c. two
 - d. one

3. The shortest distance between the point of origin and the point of termination is known as:
 - a. displacement
 - b. distance
 - c. velocity
 - d. short cut

4. The ratio of total distance travelled to the time interval is known as :
 - a. acceleration
 - b. distance
 - c. speed
 - d. work done

5. They have definite volume and take the shape of the container.
 - a. molecule
 - b. solids
 - c. liquids
 - d. gas

6. The resistance between the opposite faces of a meter cube:
 - a. resistivity
 - b. resistance
 - c. conductor
 - d. insulator

7. Steel is an alloy of iron and carbon to the ratio of:
- 2:1
 - 1:1
 - 4:1
 - 4
8. The ability of a material to be drawn out into small cross section:
- hardness
 - ductility
 - plasticity
 - auto cad
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 gradual destruction of materials, (usually metals), by chemical reaction with its environment is:
- welding
 - friction
 - force
 - corrosion
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. Cast iron is an alloy of iron and carbon to the ratio of:
- 2:1
 - 5:1
 - 1:4
 - 4:1
20. In any closed circuit there is:
- no current flow
 - 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. Corrosion can also occur in materials other than metals, such as ...1....or
.....2.....
- B. Mass, volume energy and time are -----3-----quantities and velocity,
acceleration, force are -----4-----quantities.
- C. Output power consists of -----5----- and -----6-----.
- D. Causes of rusting are -----7-----and -----8-----coming in contact with the
iron.
- E. Rate of doing work is ----9----- and the ability to do work is-----10----- to a
substance.

SECTION C**(30 MARKS)**

1. Show the atomic structure of Aluminum. (3 Marks)
2. Outline four characteristics of magnetic lines of force. (4 Marks)
3. List three characteristics of metals AND three characteristics of non-metals. (6 Marks)
4. List the three (3) methods of heat transfer and draw relevant diagrams. (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) factors upon which pressure exerted by static fluid depends. (3 Marks)
7. Name four (4) methods of prevention and treatment of corrosion. (4 Marks)

SECTION D**(40 MARKS)**

1. Calculate the amount of work done if a force of 520 N has to be exerted to move a body a distance of 4.3 m in 5 s and 30s.
(3 marks)
2. A stone is dropped from an aeroplane. Determine
 - (a) Its velocity after 2 s.
 - (b) The increase in velocity during the third second, in the absence of all forces except that due to gravity.(4 marks)
3. During a research project deep sea photographs were made at a depth of 4 kilometers. (Density of sea water is 1025kg/m^3). Calculate the:
 - a. Pressure at this depth. (3 marks)
 - b. Force on the plane surface of the window of the camera enclosure that measured $0.53\text{m} \times 0.34\text{m}$. (3 marks)
4. The field windings of a generator has a resistance of $150\ \Omega$ at a temperature of 25°C . What will be the resistance of the windings when the machine temperature rises on full load to 80°C ? ($3 \ \& \ 4 \alpha = 0.00427$)
(4 marks)
5. How many units of heat energy are created by a $55\ \Omega$ resistor connected to a 240 V supply if the supply is left switched on for one hour 12 minutes?
(4 marks)
6.
 - (a) A motor cycle moving with a speed of 5m/s is subjected to an acceleration of $0.2\ \text{m/s}^2$. Calculate the speed of motor cycle after 10 seconds. (2 marks)
 - (b) A boy is waiting at a spot light. When it finally turns green, he accelerated his car from rest at a rate of 5m/s^2 for a time of 8 seconds. Find the displacement of the boy car during this time period. (2 marks)
7. An object started moving with an initial velocity of 10m/sec , after traveling a distance of 5m gets a velocity 20m/sec . Find its i) acceleration ii) time taken for 5m displacement.
(3marks)
8. A 3 KW electric motor is operating at 1440 rpm. Calculate the:
 - a. torque exerted
 - b. Efficiency of the motor if the losses were 360 W.(5 marks)
9. A certain marble landmark has a mass of 4.5 tonnes (4500 kg) cools down from 65°C to 20°C and in doing so gives out 2.5 mega joules of heat. What is the specific heat of this marble?
(4 marks)

10. A body of mass 100 kg lies on a horizontal surface. Find the work done in sliding this body for a distance of 15 m over the surface if the coefficient of friction between the surfaces in contact is 0.25. (3 marks)
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The End

All the Best