TEVETA
Technical Education, Vocational and Entrepreneurship Training Authority

DIPLOMA IN AUTOMOTIVE ENGINEERING

LEVEL 6 YEAR I EXAMINATION

FINAL INTEGRATED SUMMATIVE EXAMINATIONS

SITTING: APRIL/MAY 2025

SUBJECT: AUTOMOTIVE ELECTRICITY

TIME: THREE (3) HOURS TOTAL MARKS: 100

PASS MARK: 50

INSTRUCTIONS TO CANDIDATE

1. Write your Examination number and National Registration Card (NRC) number on the answer booklet provided. Ensure you append your signature in the space provided on the answer booklet.
2. Write the ANSWER SCRIPT SERIAL NUMBER on the examination register and on the entry slip provided.
3. This paper consists of EIGHT (8) questions.
4. Answer FIVE (5) questions. Question one (1) is compulsory and choose any other four (4) questions.
5. All questions carry equal marks.
6. Cell phones and programmable calculators are not allowed in the examination room.

DO NOT TURN THIS PAPER UNTIL YOU ARE TOLD TO DO SO

QUESTION 1 - COMPULSORY

A. Identify three (3) types of electrical circuits. [3 marks]

B. State four (4) characteristics of a parallel circuit. [4 marks]

C. In the circuit below, Solve:

(i) the resistance value of lamp1. [3 marks]

(ii) voltage drop (Vd) across lamp 2. [3 marks]

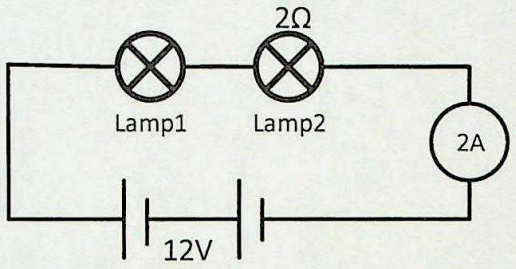


Figure Q2(B)

D. Solve the electrical energy consumed in the circuit above if it switched on for 2 minutes. [3 marks]

E. Explain what will happen in the circuit of figure Q2(B), if one (1) bulb is added in series with the other two bulbs. [4 marks]

[TOTAL: 20 MARKS]

QUESTION 2

A vehicle fitted with air conditioning allows the temperature of the cabin to be controlled.

A. Define the following terms:

(i) Convection. [2 marks]

(ii) Radiation. [2 marks]

B. Describe the operation of the vehicle air conditions system. [10 marks]

C. Explain functions of the following air conditioning components:

(i) Receiver drier. [3 marks]

(ii) Thermostatic expansion valve. [3 marks]

[TOTAL: 20 MARKS]

QUESTION 3

A. Define the following basic electrical terms:

(i) Ion. [1 mark]

(ii) Polarity. [1 mark]

(iii) Charge [1 mark]

(iv) Power. [1 mark]

(v) Alternating current. [1 mark]

(vi) Circuit. [1 mark]

(vii) Inductor [1 mark]

B. Describe the structure of an atom. [4 marks]

C. State two (2) types of dynamic electricity. [2 marks]

D. Sketch two (2) graphs showing the output Voltage-Time graph of the above types of electricity. [4 marks]

E. Describe four (4) factors which affect resistance in a conduct. [4 marks]

[TOTAL: 20 MARKS]

QUESTION 4

The vehicle battery is used as a source of energy in the motor vehicle.

A. State five (5) functions of a vehicle battery. [5 marks]

B. What is the chemical composition of the following when the battery is charged and discharged?

(i) Positive plate. [2 marks]

(ii) Negative plate. [2 marks]

(iii) Electrolyte. [2 marks]

C. Describe three (3) ways in which batteries are rated. [9 marks]

[TOTAL :20 MARKS]

QUESTION 5

The ignition system transforms low battery voltage to high voltage enough to jump across the spark gap.

A. Identify components marked A, B, C, D, E and F on the ignition distributor in Figure Q5. [6 marks]

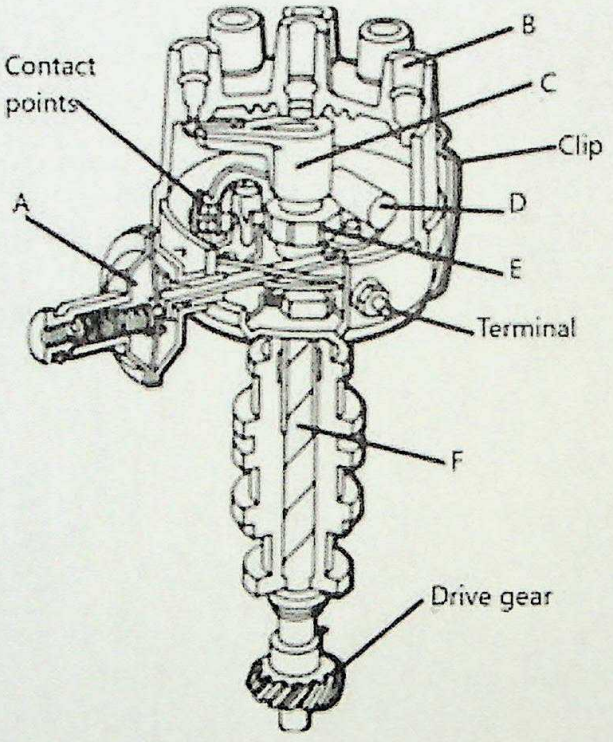


Figure Q5

B. Explain the function of the components marked A, B, C, D and E. [10 marks]

C. Describe the operation principle of an ignition coil. [4 marks]

[TOTAL: 20 MARKS]

QUESTION 6

A. Identify number codes of the following:
   (i) Ignition coil negative. [1 mark]
   (ii) Battery negative. [1 mark]
   (iii) Earth return via switch. [1 mark]
   (iv) Alternator output terminal. [1 mark]
   (v) Dip switch to main switch beam bulb. [1 mark]

B. Sketch symbols of the following:
   (i) Fuse. [2 marks]
   (ii) Voltmeter. [2 marks]
   (iii) Electric motor. [2 marks]
   (iv) Spark gap. [2 marks]
   (v) Ac generator. [2 marks]

C. State three (3) types of circuit protectors used in the vehicle circuits. [3 marks]

D. What is the meaning of the following switch actions?
   (i) SPDT. [1 mark]
   (ii) DPTT. [1 mark]

[TOTAL: 20 MARKS]

QUESTION 7

The starter motor is normally used to crank the engine in order to create compression.

A. Define the starter motor in terms of energy conversion. [1 mark]

B. State the function of an armature. [2 marks]

C. Identify the parts of the armature marked A, B, C and D in figure Q7. [4 marks]

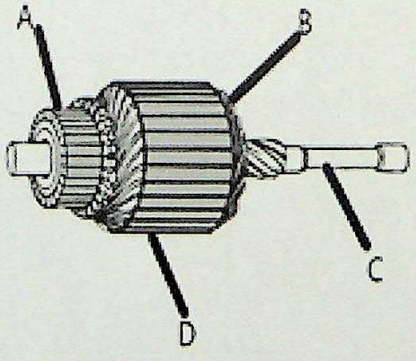


Figure Q7

D. State the functions of the parts A, B, C and D in figure Q7. [8 marks]

E. State functions of the following starter motor parts:
   (i) Solenoid. [3 marks]
   (ii) Overrunning clutch. [2 marks]

[TOTAL: 20 MARKS]

QUESTION 8

Alternators are charged with the responsibility of suppling power to all electrical components when the engine is running.

A. Identify the components of the dissembled alternator in figure Q8 below. [6 marks]

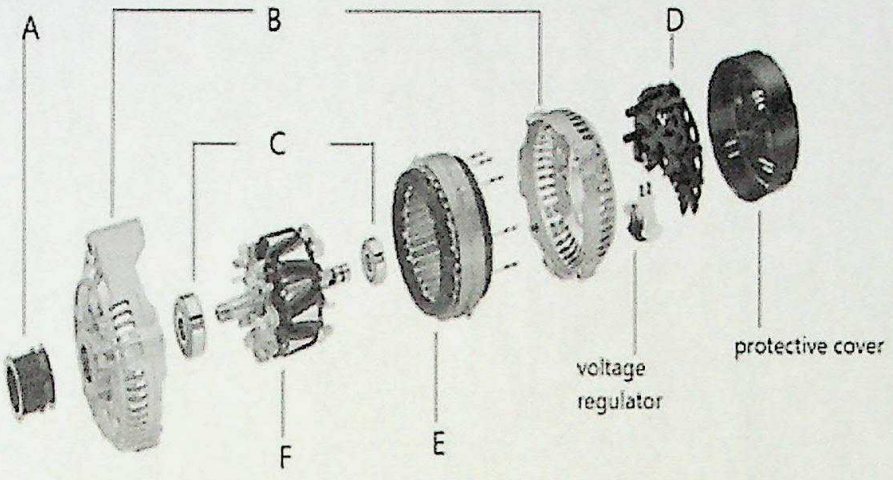


Figure Q8

B. Sketch two (2) type of wounding methods used by manufacturer to construct component E. [2 marks]

C. Draw a circuit of component D if used on the self-excited alternator. [6 marks]

D. State the function of the coil on the component marked E. [2 marks]

E. Explain the meaning of three- phase output. [4 marks]

[TOTAL: 20 MARKS]