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ASSESSMENT COVER PAGE : INTERNAL EXAMINATION

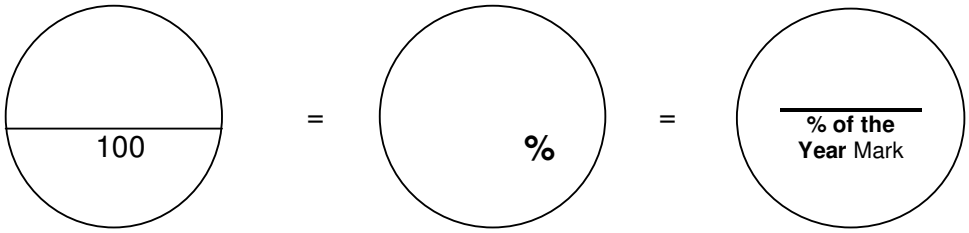
CORE

SUBJECT: ELECTRICAL PRINCIPLES AND PRACTICE **LEVEL: 3** DATE: **...../09/2019**
FOCUS GROUP EXAMINER: **JT KAYEMBA** FOCUS GROUP MODERATOR:

COLLEGE MODERATOR: **E HALFCROWN**

Student Surname		Name	
ID. Number		Group	

Topic and outcomes	ALL
Duration	3 HOURS
Evidence Required	ANSWER SHEET
Instrument	MEMORADUM



Paper 1	
Question	**Mark obtained**
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Total	

Rating Scale	Remark	Rating
5	Outstanding	80 - 100
4	Highly competent	70 - 79
3	Competent	50 - 69
2	Not yet Competent	40 - 49
1	Not achieved	0 - 39

SIGNATURES:

Student declaration: I declare that the evidence provided is my own work.

STUDENT: _____ DATE: _____
(Signature)

FEEDBACK: _____
(Indicate which questions you found difficult (tick √)

1	2	3	4	5	6	7	8	9	10

LECTURER: _____ DATE: _____
(Print Name and Sign)

COMMENT: _____

_____

MODERATOR: _____ DATE _____
(Print Name and Sign)

Please turn over

TIME: 3 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

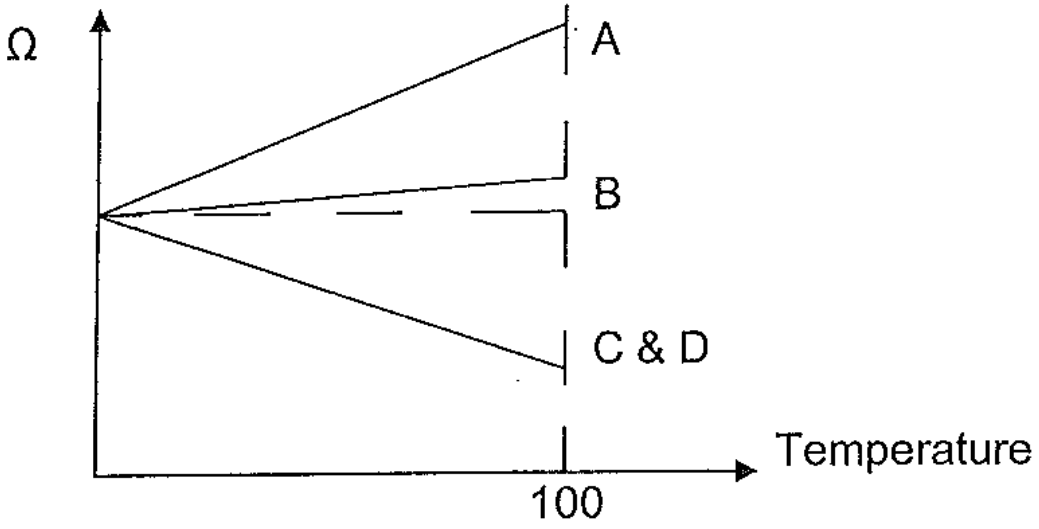
1. Answer ALL the questions.
2. Read ALL the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. Write neatly and legibly.

QUESTION 1

1.1 Establish the difference between a valence electron and a free electron (2)

1.2 If the atomic number of Aluminium is 13, how many electrons will:
1.2.1 the last shell occupy (1)
1.2.2 the second shell occupy (1)
1.1.5. the first shell occupy (1)

1.3 The figure below shows a graph of resistance/temperature of FOUR materials. Identify the materials labelled A – D. Write only the answer in your answer book.



(4)

1.4 What difference would you make between *electromotive force* and *potential difference*? (2)

1.5 An ion is an atom that has lost or gained one or more electron. Give an another name for "*positive ion*" (1)

1.6 List FOUR materials which have a positive temperature coefficient of resistance. (4)

1.7. Calculate the cost to use a 7KW geyser for 9 hours if one unit of electricity cost 49 cents (4)

[20]

QUESTION 2

2.1 The size and the direction of forces between the current-carrying conductors depend on certain factors.

State those FOUR factors. (4)

2.2. What do you understand by the term ‘reluctance’. (1)

2.3. A conductor 550 mm long moves at a uniform velocity of 10 m/s at right angles to a uniform magnetic field of flux density of 6.5 T.

Calculate the following:

2.3.1. The maximum emf induced in a conductor. (2)

2.3.2. The instantaneous value of the induced emf if the conductor has moved through 30° from zero. (2)

2.5 State THREE applications of electromagnets. (3)

2.6 Explain the principle of 'Mutual Induction' as in transformers. (3)

2.7 Two conductor each carrying a current of 5A are placed 4 mm apart. Calculate the Force in Newton meter length between them (2)

2.8 If a coil of 20cm long has 80 turns and a current of 2A flowing through. Calculate the magnetic field strength (H) in Amp per meter (A/m). (3)

[20]

QUESTION 3

3.1 In a parallel circuit, calculate the value of current through each resistor, if R_1 is 4 ohms and R_2 is 2 ohms and that the total current is 10A? (4)

3.2 There are various factors that significantly affect the life and performance of a battery.

State FOUR main factors determining the capacity of a lead acid battery. (4)

3.3 Three capacitors of 10 µF, 5µF and 25µF are connected in parallel to a 80 V DC voltage supply.

Calculate the following:

3.3.1 The total capacitance of the circuit. (2)

3.3.2 The total charge (2)

3.3.3 The charge across the10 µF capacitor. (2)

3.4 Inductors are characterized by the factors that affect the inductance. List FOUR of these factors. (4)

3.5 A three-phase star connected motor draws a current of 12 A from a 480 V supply at a power factor of 0,9 lagging.

Calculate the following:

3.5.1 The apparent input power

3.5.2 The active input power.

3.5.3 The phase voltage of the motor windings

(3 × 2) (6)

3.6 Four cells, each with an EMF of 2 volts and an internal resistance of 0,15 ohms are connected in parallel across a load resistor of 10 ohms.

Calculate the following:

3.6.1 The battery's total open circuit EMF (1)

3.6.2 The total circuit current (2)

3.6.3 The voltage drop inside the battery (2)

3.7 Describe the limitations when using an auto-transformers (3)

3.8 Calculate the energy stored in the magnetic field of an inductor of a 5 H inductor if 3000 milli-Ampere flows through it. (2)

3.9 List TWO factors influencing the capacitance of a capacitor (2)

[36]

QUESTION 4

4.1 State THREE disadvantages of moving iron instruments . (3)

4.3 A moving coil instrument give fall side deflection when 10 m A is flowing through it. The meter has a resistance of 20Ω. Calculate the resistance needed in parallel to extend the range of the meter to measure up to 1 Ampere (3)

4.3 Consider an analogue multi-meter having the following DC ranges: (

Voltage: 3 V, 10 V, 30 V, 100 V
Current: 500 µA, 1 mA, 10 mA, 100 mA, 1 A

Which range would be best suited to select when measuring the following:

4.1.1 The terminal voltage of a 4,5 V battery

4.2.2 A voltage drop of 0,6 V across a semiconductor diode

4.3.3 A current of 5 mA through a circuit

4.4.4 The base current of 300 µA through a transistor (4 × 1) (4)

[10]

QUESTION 5

5.1 What do you understand by the term 'Differentially compounded ' windings (1)

5.2 Draw a neat, labelled circuit diagram of a resistance –start induction–run motor. (4)

5.3 Explain how the following protection devices protect motors in a circuit:

5.3.1 Overload Relay

5.3.2 No volt release coil

(2 × 2) (4)

5.5 The full- load armature current of a direct current motor is 40 A and its resistance of the armature is 0,25Ω.

Calculate the value of the back emf if the supply voltage is 400 V. (2)

5.6 List THREE losses in DC machines. (3)
[14]

TOTAL: 100

FORMULAE SHEET

ELECTRICAL PRINCIPLES AND PRACTICE

1. $Cos\phi = \frac{R}{Z}$

2. $P = V\ I\ Cos\phi$

3. $Q = V\ I\ Sin\phi$

4. $S = V\ I$

5. $V_1 = \left(\frac{R_1}{R_t}\right) V_T$

6. $I_1 = \left(\frac{R_2}{R_1 + R_2}\right) I_T$

7. $R_T = R_1 + R_2 + R_3$

8. $\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$

9. $\frac{V_1}{V_2} = \frac{N_1}{N_2} = \frac{I_2}{I_1}$

10. $V_L = \sqrt{3}\ V\ p\ h$

11. $E = V - I_a\ R_a$

12. $f = \frac{Np}{60}$

13. $S = \frac{N_s - N_r}{N_s}$

14. $R_{sh} = \frac{I_m\ R_m}{I_{sh}}$

15. $R_{se} = \frac{V_t}{I_t} - R_m$

16. $F = B\ I\ l$

17. $\tan\phi = \sqrt{3}\left(\frac{W_1 - W_2}{W_1 + W_2}\right)$

18. $E = V + I\ r$

19. $V = I\ R$

20. $R = \frac{p\ l}{A}$

21. $R_t = R_0(1 + \alpha t)$

22. $\frac{R_1}{R_2} = \frac{1 + \alpha t_1}{1 + \alpha t_2}$

23. $P = V\ I$

24. $P = I^2R$

25. $\eta = \frac{P_0}{P_{in}} \times 100$

26. $X_L = 2\pi\ f\ L$

27. $X_C = \frac{1}{2\pi\ f\ C}$

28. $Z = \sqrt{R^2 + (X_L - X_C)^2}$

29. $Mmf = N\ I$

30. $H = \frac{Mmf}{l}$

31. $B = \frac{\Phi}{A}$

32. $E = B\ l\ v$

33. $E = -L\frac{\Delta I}{t}$

34. $A = \frac{\pi d^2}{4}$

35. $E = \frac{1}{2} C V^2$

36. $Q = C V$

37. $F = 2\times10^{-7} \times \frac{I_1 I_2}{d}$

38. $I = \frac{Emf}{R_T + r_T}$

39. $L = N\frac{\Delta \phi}{\Delta I}$

40. $E = V + R_a I_a$

41.. $E = \frac{1}{2} L I^2$