**Name:…………………………………….....................ADM No:………......Class:……....**

**488/1**

**ELECTRICITY**

**PAPER 1**

**DECEMBER 2021**

$2\frac{1}{2}hours$

**MECS CLUSTER JOINT EXAMINATION**

**FORM FOUR END OF THE TERM TWO EXAMINATION 2021**

**ELECTRICITY**

**INSTRUCTIONS TO CANDIDATES**

1. Write your name, index number and class in the spaces provided above.
2. The paper contains two sections**: Section A** and **Section B**
3. Section A carries **52 marks** while section B carries **48 marks**
4. The paper contains **13 PRINTED** pages make sure all **PAGES ARE PRINTED** and **NON IS MISSING**
5. Answer **ALL** the questions in **section A** and **ANY FOUR** questions in **section B**
6. All the answers and working must be written on the question paper in the spaces provided below each question.
7. Non-programmable silent electronic calculators are allowed for use

**For examiner use only**

**Section A**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | **Total** |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

**Section B**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 15 | 17 | 15 | 19 | 28 |
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 **GRAND TOT**

**SECTION A (52 Marks)**

1. (a). Name four prime movers used in the process of generation electricity in Kenya

 (2 marks)

 (b). State two responsibilities of the following job groups (2 marks)

1. Artisan
2. Technician
3. (a). State four main components of a business plan (2 marks)

(b). State four causes of electric shock in a workshop (2 marks)

1. (a). State two safety precaution that needs to be put in place to avoid accidents from overhead power lines (2 marks)

(b). Draw a common base transistor configuration circuit (1 mark)

1. The **figure 1** shows a logic gate



***Figure 1***

1. Give the name of the logic gate (1 mark)
2. Draw the truth table for the logic gate shown (2 marks)
3. (a). Differentiate between a conductor and a semi-conductor. (1 mark)

(b). State one area of application for each of the above materials (2 marks)

1. State four uses of ohmmeter function of a multimeter in trouble shooting circuits

 (2 marks)

1. (a). Using a schematic diagram, show how a lamp can be controlled from two different position (2 marks)

(b). Find the resistance of a resistor whose color code is:

1. marks)

 i). Grey, Red, Gold, Gold

 ii). Green, White, Black, Gold

1. With aid of a diagram, differentiate between repulsion and attraction type moving iron meter (4 marks)
2. A single phase step-down transformer has a ratio of 8:1, a primary voltage of 3.3kV and a load of 6.6kVA. Ignoring losses, calculate; (6 marks)
3. Secondary voltage
4. Secondary current
5. Sketch the symbol for the following circuit symbol (2 marks)
6. Zener diode
7. Incandescent lamp
8. (a). State the meaning of capacitance (1 mark)

(b). State three factors that affect the capacitance of a capacitor (3 marks)

1. (a). What is an autotransformer (1 mark)

(b). An autotransformer has 1200 turns connected to 250V a,c to supply a 60V load. Calculate the number of turns in the secondary section (2 marks)

1. (a). Three inductors of 60mH, 120mH and 75mH respectively, are connected together in a parallel combination. Calculate the total inductance of the parallel combination (1 mark)

(b). Find the total energy in the circuit given that the total current is 2.5A.

 (2 marks)

1. (a). State three parts of a machine ($1\frac{1}{2} $marks)

(b). An alternating current completes ten cycles in 0.1 seconds. Calculate the period and frequency of the current. ($1\frac{1}{2} marks$)

1. In a 12V dc system a 40W solar panel is exposed to the sun for six hours daily. Calculate the number of days it will take to fully charge a 60 ampere-hour battery (4 marks)

**SECTION B (48 Marks)**

1. **Figure 2** shows and RLC circuit. (12 marks)

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***Figure 2***

Calculate the:

1. Inductive reactance
2. Capacitive reactance
3. Circuit impedance
4. Circuit current
5. Power dissipated in the circuit

1. (a). With aid of a labelled diagram, explain the principle of operation of a trembler bell.

 (9 marks)

(b). With aid of a diagram, differentiate between shunt generator and series d.c generator

 (3 marks)

1. **Figure 3** shows the isometric view of a towing hook.

Draw, full size, in third angle projection: (12 Marks)

 (a). front elevation in the direction of arrow A;

 (b). end elevation in the direction of arrow B



***Figure 3***

1. (a). With reference to Sinusoidal waveforms, explain each of the following terms

 (3 marks)

1. Amplitude
2. Period
3. Frequency

 (b). A Sinusoidal voltage trace displayed on an oscilloscope has peak voltage of 48V and a period of 80 ms. (9 marks)

Draw the waveform and calculate:

1. Frequency

1. Average value
2. RMS value
3. (a) Explain why a series motor develops high torque when subjected to a heavier load

 (5 marks)

 (b) A 240V/120V, 1.2kVA transformer delivers power to a load. Calculate the:

1. Transformation ratio
2. Rated secondary current
3. Primary impedance at the rated load
4. Number of turns in secondary winding if the primary winding induces 0.2V per turn (7 marks)