UGANDA MARTYRS UNIVERSITY

FORT PORTAL CAMPUS

FACULTY: ENGINEERING AND APPLIED SCIENCE

DEPARTMENT: DEPARTMENT OF ELECTRICAL ENGINEERING

COURSE CODE: **BEE2105:** COURSE NAME: **ENERGY SYSTEMS**

FINAL ASSESSMENT

ACADEMIC YEAR 2023/2024 SEMESTER 1

BACHELOR OF SCIENCE IN ELECTRICAL ENGINEERING

Date of Examination: 11TH DECEMBER 2023

Time allowed: 3 hours (2:00Pm – 5:00Pm)

Instructions to Candidates:

Read the following before answering the examination questions.

1) This Exam contains **Six (6)** questions.
2) Attempt any **four (4)** questions of your choice.
3) All Questions carry equal marks.
4) Show all the necessary workings.
5) Start each question on a fresh page.
6) Read other instructions on the answer booklet.
7) Show all your working in the answer booklets provided by the invigilator
8) Do **NOT** write anything on this question paper.

You should have the following in this Examination.

Answer Booklet, Drawing instruments, graph papers, non-programmable calculator and IEE Tables for the current ratings and voltage drops, 17th edition.

Question One:

(a) Explain any three (3) reasons for the increased campaign to shift to renewable sources of pow for generation (6 Marks)

(b) Explain why hydropower is not promoted as much as wind and solar among renewable energy technologies (9 Marks)

(c) Discuss the difference(s) between the energy conversion process used in wind turbine power generation and coal driven power plants (10 Marks)

Question Two

(a) Explain what is meant by the term energy systems (4 Marks)

(b) Discuss any five importance of energy systems (15 Marks)

(c) Highlight any three (3) applications of energy systems (6 Marks)

Question Three:

A client having a 4 bedroomed house needs, desires to have a fully functional standalone solar PV powered system. The following are his requirements:

- Each room to have at least 1 light bulb of 10 W, daily running for 4 hours.
- He has 2 rechargeable torches each of 5 W and take 1.5 hours to fill up.
- Two Samsung tablets rated at 15 W, taking 2 hours to fully charge.

Stating any assumptions, design the client's solar PV power system (25 Marks)

Question Four:

Explain any five (5) grid applications of Energy storage systems (5 Marks @)

Question Five:

(a) With the aid of a labeled block diagram, briefly explain the important parts of an energy storage system. (9 Marks)

(b) Highlight the 2 technical advantages and disadvantages of the following battery types

(i) Lead acid batteries (4 Marks)

(ii) Nickel – Cadmium (Ni-Cd) batteries (4 Marks)

(iii) Lithium-Ion (Li-Ion) batteries (4 Marks)

(iv) Sodium – sulfur (Na-S) batteries (4 Marks)

Question Six:

(a) Highlight any four considerations in selecting a location for a thermal power plant (8 Marks)

(b) Highlight any three advantages and three disadvantages associated with Coal power plants (9 Marks)

(c) Briefly explain the process of coal formation (8marks)

End