

TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology

Department of Electrical and Electronic engineering

UNIVERSITY EXAMINATION:
Diploma in Electrical Power Engineering (DEPE 4)
ELECTRICAL POWER SYSTEMS I
EEP 2205

END OF SEMESTER IV EXAMINATION

SERIES: MAY 2016

TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **five** Questions;. Attempt any **THREE** Questions.

Do not write on the question paper.

Question ONE

- (a) State:
- (i) **TWO** reasons that make transmission of electrical energy by underground cables unsuitable.
 - (ii) **THREE** essential properties of each of the following in overhead line transmission:
 - (I) Conductors
 - (II) Line supports
 - (III) Insulators

(11 marks)

- (b) Define the following terms:
- (i) Load factor
 - (ii) Plant use factor
 - (iii) Plant capacity factor i_p, r_p .

(6 marks)

State **THREE** items of information derived from load curves.

(3 marks)

Question TWO

- (a) (i) Explain why an excitation system is necessary.
- (ii) State the characteristics required of an excitation system.
- (iii) State the factors determining amount of excitation required.
- (iv) Explain why individual exciters are preferred to centralized system.

(10 marks)

- (b) With the aid of a diagram describe the a.c excitation system with thyristor amplifiers (10 marks)

Question THREE

- (a) Explain the following in a generating power plant:

- (i) Super heater
- (ii) Economizer

(4 marks)

- (b) State the draw backs of a nuclear power plant.

(4 marks)

- (c) State the roles of voltage regulators in a power plant.

(3 marks)

- (d) Explain the following in a hydroelectric generating station:

- (i) Spill ways
- (ii) Surge tank
- (iii) Penstock

(9 marks)

Question FOUR

- (a) State FOUR factors:
- (i) Affecting sag in an overhead line
 - (ii) That determine the type of supports for overhead lines
- (8.marks)
- (b) An overhead transmission line at a river crossing is supported by two towers of height 30m and 90 metres respectively. The tower bases are at the water level. The horizontal distance between the towers is $500m$. The conductor weighs $1.5kg$ per metre length and has an ultimate tension of $62.78KN$ and safety factor is 4.

Determine:

- (i) Sag at the *lower support*
- (ii) Sag from the *higher support*
- (iii) Minimum clearance of the conductor and water level

(12 marks)

Question FIVE

- (a) Explain:
- (i) Why potential distribution over an insulator string is not uniform.
 - (ii) **THREE** methods of improving the insulator string potential distribution.
- (8 marks)
- (b) A string of six suspension insulators is used to support one conductor of a $66kV$ three phase overhead line. The air capacitance between each cap-pin junction and the earthed metal tower is one tenth of the capacitance of each unit.

Determine:

- (i) The voltage distribution
- (ii) The string efficiency

(12 marks)