TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology

Department of Electrical and Electronic engineering

Diploma in Electrical Power Engineering (DEPE 4)

ELECTRICAL POWER SYSTEMS I

EEP 2205

END OF SEMESTER IV EXAMINATION

SERIES: AUGUST 2024

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 FOUR

(i) forms of energy other than electrical energy

(ii) sources of energy

(8 marks)

(b Define the following terms with reference to electric power generating stations;

(i) Load factor.
(ii) Plant use factor.
(iii) Plant capacity factor.

(6 marks)

(c) (i) Explain station load curves
(ii) State Four items of information deduced from the load curves

(6 marks)

Question TWO

(a) (i) Explain why an excitation system is required
(ii) State the necessary characteristics required of an excitation system.
(iii) State the factors that determine the amount of excitation required.
(iv) Explain why individual exciters are preferred to centralized systems
(v) Explain why d.c. excitation systems have been superseded by the a.c excitation Systems

(11 marks)

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

(9 marks)

Question THREE

(a) (i) Explain the role of the following in an electrical generating steam power plant
(I) Super heater
(II) Economiser
(ii) State the drawbacks of a nuclear power plant

(8 marks)

(b) State three roles played by voltage regulators in a power plant. (3 marks)

(c) Explain the roles played by the following in hydroelectric power stations
(i) spillways
(ii) surge tank
(iii) automatic isolating valves

(6 marks)

Question FOUR

(a) Explain
(i) why voltage distribution over an insulator string is not uniform.
(ii) Three methods used to improve the potential distribution over an insulator string

(8 marks)

(c) A string of six suspension insulators is used to support one conductor of a 66-KV three phase overhead line. The air capacitance between each cap/pin junction and the tower is one tenth of the capacitance of each unit .

Determine;
(i) The voltage distribution
(ii) string efficiency

(12 marks)

Question FIVE

(a) State Four factors;

(i) affecting sag in overhead lines.

(ii) that determine the type of support for overhead lines

(8 marks)

(b) An overhead transmission line at a river crossing is supported by two towers of height 35M and 95M respectively. The conductor weighs 1.5 kg/m and has an ultimate tension of 62.784KN and the safety factor is 4. The span is 500M and the lowest point on the conductor is midway between the river banks. The bases of the towers are at the water level.

Determine

(i) Sag at the lower support

(ii) Sag from the higher support

(iii) Minimum clearance of the conductor and water level

(12 marks)