



TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology

Department of Electrical and Electronic engineering

Diploma in Electrical Power Engineering

ELECTRICAL POWER SYSTEMS I

EEP 2205

TIME: 2 HOURS

SERIES: NOVEMBER 2024

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 with reference to electric power generating stations;

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

(6 marks)

(c) State Four items of information deduced from the load curves

(3 marks)

Question TWO

(a) (i) Explain the role of the following in an electrical generating steam power plant

- (I) Super heater
- (II) Economizer

(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 THREE

(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(v) Explain why d.c excitation systems have been superseded by the a.c excitation Systems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 FOUR

(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 30M and 90M Respectively with their bases at the water level. The horizontal distance between the towers is 500M The conductor weighs 1.5 kg/m and has an ultimate tension of 62.784KN and the 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 voltage distribution over an insulator string is not uniform.
- (ii) Three methods used to improve the potential distribution over an insulator string

(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 tower is one tenth of the capacitance of each unit.

Determine;

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

(12 marks)