TECHNICAL UNIVERSITY OF MOMBASA

School of Engineering and Technology

Department of Electrical and Electronic engineering

Diploma in Electrical Power Engineering

Electrical machines II

END OF SEMESTER EXAMINATION

SERIES: MAY 2025

TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

Attempt THREE of the following FIVE questions

All questions carry equal marks

Do not write on the question paper.

Question ONE

(a) (i) State THREE conditions to be satisfied before a synchronous motor is connected to the supply.

(ii) State the equipment that indicates compliance with I(a)(i) above.

(6marks)

(b) Explain the effect of the following an synchronous motor without changing the load:

(i) Over exciting

(ii) Under exciting

(11 marks)

(c) Explain how the speed of a synchronous motor can be altered. (3 marks)

Question TWO

(a) State the merits of using per unit values in transformer analysis. (4 marks)

(b) A 30MVA transmission line operates at 66kV. It is connected through a 1000KVA transformer having 5% reactance to a generating station busbar. The generator is of 2500KVA with 10% reactance. Determine the full load current delivered.

(8 marks)

(c) A 500V 10KVA single phase generator has an open circuit voltage of 500V. When the load current is 25A at a certain power factor the terminal voltage falls to 480V.

Determine:

(i) The output voltage

(ii) Output current

(iii) Voltage regulation

(8 marks)

Question THREE

(a) State the conditions to be satisfied in order for three phase transformers to be operated in parallel. (4 marks)

(b) State the FOUR groups in which transformers are classified and state what determines the classification. (8 marks)

(c) A 400KVA transformer having 0.01 p.u. resistance and 0.05p.u. reactance is connected in parallel with 200KVA transformer 0.012p.u. resistance and 0.04p.u. reactance. Determine how they share a load of 600KVA at 0.8pf lagging. (8 marks)

Question FOUR

(a) Explain why it is advisable to improve a consumers power factor. (4 marks)

(b) Explain why a synchronous motor is referred to as a synchronous condenser. (4 marks)

(c) A 2300V 60Hz six pole synchronous motor drives a constant torque load of 5000Nm. The synchronous reactance of the motor is 6Ω. Determine the minimum excitation that the machine must maintain to provide the required torque. (12 marks)

Question FIVE

(a) Explain the following:

(i) Hunting in synchronous motor
(ii) Causes of hunting
(iii) How hunting is countered
(iv) Pull out torque

(10 marks)

(b) Explain the effect of adding load on a synchronous motor. (5 marks)

(c) Explain the lamps dark method of synchronizing. (5 marks)