TECHNICAL UNIVERSITY OF MOMBASA

School of Engineering and Technology

Department of Electrical and Electronic engineering

Diploma in Electrical Power Engineering

ELECTRICAL MACHINES II
EEP 2301

SERIES: APRIL 2023

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) (i) Define the per unit (p.u.) system.

(ii) State FOUR reasons justifying the per unit system in electrical system analysis. (6 marks)

(b) Explain why transformers are rated in KVA. (4 marks)

(c) A generator rated 1000VA and 200V has internal impedance of j10Ω. The generator impedance is stamped on the name plate as j25% together with the other ratings. The generator is short circuited at its terminals.

Determine:

(i) The short circuit current

(ii) The short circuit power delivered by the generator in:

(iii) Per unit

(iv) Percentage (%)

(v) Actual units

(10 marks)

Question TWO

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

(b) A three phase 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)

Questtion THREE

(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 l(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 FOUR

(a) State the conditions to be met for a three phase synchronous machine to be connected to the supply. (6 marks)

(b) Explain the methods of starting synchronous machines. (6 marks)

(c) Explain the effect of the following on a running synchronous motor:

(ii) Increasing load

(iii) Decreasing the load

(6 marks)

(d) Explain 'pull out Torque' for a synchronous machine. (2 marks)

Question FIVE

(a) State TWO applications of the following:

(i) Stepper motor

(ii) Hysteresis motor

(4 marks)

(b) With reference to stepper motors explain:

(i) Holding torque

(ii) Step accuracy

(4 marks)

(c) A stepper motor has a step angle of 2.5° and a stepping frequency of 3600 pulses per second. Determine:

(i) Resolution

(ii) Number of steps required for the shaft to make 25 revolutions

(iii) Shaft speed

(12 marks)