TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology

Department of Mechanical Engineering

UNIVERSITY EXAMINATION FOR:

Diploma in Plant Engineering

EEP 2303: plant electrical III

END OF SEMESTER EXAMINATION

SERIES: NOVEMBER 2024

TIME: 2 HOURS

DATE:

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.

1. (a) (i) Differentiate between a transformer and a motor
   (ii) With an aid of a diagram, describe the construction of a transformer. (10 marks)
   (b) (i) Outline the maintenance schedule for attended indoor or outdoor transformer.
   (ii) State the functions of the following in a transformer
   I. Breathers
   II. Conservators. (10 marks)
2. (a) Explain the principle of operation of a three-phase induction motor. (8 marks)
   (b) State and explain **THREE** main losses in an induction motor. (6 marks)
   (c) Power to an induction motor is supplied by a 12 pole, three-phase,500 rpm alternator. The full load speed of the motor is 1440 rpm. Find the;
   I. Percentage slip
   II. Number of poles in the motor. (6 marks)
3. (a) (i) Briefly explain the principle of operation of a three-phase induction motor
   (ii) State **THREE** disadvantages of three phase induction motors. (9 marks)
   (b)(i) A 10 H.P, 4 pole, 50Hz 3-phase wound rotor induction motor is taking 12kW from the line. The core losses, stator copper losses rotor copper losses are 300W, 550W and 450W respectively while the friction and windage losses amount 150W.

Determine the;

(i) Power transferred across the air gap.

(ii) Mechanical power developed by the rotor.

(iii) Mechanical power output.

(iv) Efficiency of the motor. (11 marks)

4. (a) (i) Explain the necessity of a starter in a motor

(ii) Using a well labelled circuit diagram, explain the stator resistance method of starting a motor. (10 marks)

(iii) State three demerits of the stator resistance method. (12 marks)

(b) The power supplied to a three-phase induction motor is 40 kW and the stator losses are 1.2 kW. If the slip is 3% determine the;

(i) Rotor copper loss.

(ii) Total mechanical power developed by the rotor.

(iii) Output power of the motor if friction and windage losses are 850W.

(iv) Efficiency oy the motor neglecting rotor iron loss. (8 marks)

5. (a) (i) Highlight **THREE** advantages of transformer tests

(ii) With aid of a well labelled diagram, explain how open circuit test is carried out in a transformer. (9 marks)

(b) Briefly explain how cooling is achieved in;

(i) Small transformers

(ii) Medium size power transformers

(iii) Large transformers. (6 marks)

(c) Highlight any **FIVE** maintenance practices carried out on transformers. (5 marks)