



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: AUGUST 2024

TIME: 2 HOURS

DATE: AUGUST 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.

1. (a) (i) Explain the following terms
 - I. Motor
 - II. Slip.
- (ii) Highlight any **FOUR** ways through which the speed of a n induction motor can be Controlled. (8 marks)
- (b) Briefly describe the construction of a three-phase induction motor. (6 marks)
- (c) State and explain **THREE** main losses in an induction motor. (6 marks)
2. (a) Explain the principle of operation of a three-phase induction motor. (8 marks)
- (b) (i) A three-phase induction motor is wound for 6 pole and is supplied from 60 Hz. System. Calculate;
 - I. frequency Synchronous speed
 - II. Speed of the rotor when slip is 3.5%, giving your answer in rpm
 - III. Rotor when the motor runs at 650 rpm.
- (ii) State any **FOUR** advantages of induction motors. (12 marks)

3. (a) With aid of a well labelled diagram, explain the principle of operation of a transformer. (8 marks)
- (b) (i) State the functions of the following in a transformer
 I. Breathers
 II. Conservator
 (ii) Explain any ways of achieving cooling in a transformer. (8 marks)
- (c) Outline the maintenance schedule for attended indoor or outdoor transformer. (4 marks)
4. (a) (i) With aid of a well labelled circuit diagram, explain the operation of a split-phase induction motor
 (ii) Give **TWO** applications of split-phase induction motor. (12 marks)
- (b) At starting the winding of a 230V, 50Hz split-phase induction motor has the following parameters.
 Main winding $R=5\Omega$, $X_L=8\Omega$
 Starting winding $R=8.5\Omega$ $X_L=4\Omega$
 Determine the;
 (i) Current I_m in the main winding
 (ii) Current I_s in the starting winding
 (iii) Phase angle between I_m and I_s
 (iv) Line current I . (8 marks)
5. (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.
 (iii) State three merits of the stator resistance method. (12 marks)
- (b) The power supplied to a three-phase induction motor is 30 kW and the stator losses are 1.1 kW. If The slip is 4% 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 of the motor neglecting rotor iron loss. (8 marks)