TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MEDICAL ENGINEERING

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN MEDICAL ENGINEERING (DME 315)

EEP 2251: **ELECTRICAL MACHINES & UTILIZATION II**

END OF SEMESTER EXAMINATION

SERIES:APRIL2016

TIME:2HOURS

DATE: Pick Date Select Month Pick Year

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of four questions. Attemptquestion ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

Question ONE (Compulsory)

(a) State **THREE** reasons why electric power is almost exclusively generated, transmitted and distributed using the 3-phase system. **(3 marks)**

(b) A balanced star-connected load of $(8 + j6)\Omega$ per phase is connected to a balanced 3-phase, 400V supply. Calculate

(i) the line current
(ii) the power-factor
(iii) the true power
(iv) the apparent power.

(10 marks)

(c) A 3-phase, star-connected alternator generates 6,360V per phase and supplies 500KW at a power-factor of 0.9 lagging to a load through a step-down transformer of turns-ratio 40:1. The transformer is delta-connected on the primary side and star-connected on the secondary side. Calculate

(i) the line voltage at the load
(ii) the current in alternator windings
(iii) the current in transformer primary windings
(iv) the current in transformer secondary windings.

(17 marks)

Question TWO

(a) State **TWO** methods of cooling in 3-phase, power transformers. **(2 marks)**

(b) Describe the following parts of a typical 3-phase transformer tank:-

(i) oil gauge
(ii) filter valve
(iii) drain valve.

(6 marks)

(c) The input current to a 3-phase step-down transformer connected to an 11KV supply system is 14A. Calculate

(i) the secondary line voltage
(ii) the secondary line current.

for a star-star connection if the voltage transformation ratio is 44.

(12 marks)

Question THREE

(a) With the aid of a labelled diagram, explain the principle of operation of a 3-phase induction motor. **(8 marks)**

(b) A 3-phase, 50Hz induction motor has 8 poles. If the full-load slip is 2.5%, calculate

(i) the synchronous speed
(ii) the rotor speed
(iii) the rotor frequency
(iv) the frequency of rotor currents at standstill.

(12 marks)

Question FOUR

(a) Compare and contrast the 3-phase synchronous motor and 3-phase alternator.**(2 marks)**

(b) State any **TWO**

(i) characteristics
(ii) applications.

of 3-phase synchronous motors.

(4 marks)

(c) Explain

(i) the effect of increasing load on a normally-excited 3-phase synchronous motor.
(ii) why a 3-phase synchronous machine is called a **doubly-excited machine.**

(14 marks)

Question FIVE

(a) Define the term **electric shock.** **(1 mark)**

(b) Compare and contrast **inspection** and **testing**. **(2 marks)**

(c) Explain how electrical system failures can be caused by

(i) under voltage
(ii) short-circuits
(iii) loose connections
(iv) unfavourable working environment.

(17 marks)