

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 DateSelect MonthPick Year

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 question ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

Question ONE (Compulsory)

- (a) Describe the following systems used in the distribution of electrical power:-
 - (i) 3-phase, 3-wire
 - (ii) 3-phase, 4-wire
 - (iii) 3-phase, 5-wire.

(6 marks)

- (b) A 220-V, 3-phase voltage is applied to a balanced delta-connected load of phase impedance $(15 + j20)\Omega$. Calculate
 - (i) the phase current in each line
 - (ii) the power consumed per phase.

(10 marks)

- (c) A balanced, 3-phase load consists of three coils, each of resistance 6Ω and inductive reactance 8Ω . Calculate the line current and power absorbed when the coils are:
 - (i) star-connected
 - (ii) delta-connected across a 400-V, 3-phase supply.

(14 marks)

Question TWO

- (a) The transmission stage of electric power supply system involves 11/132-KV, 100MVA, delta-delta, 3-phase transformer. For this transformer determine
 - (i) the current rating of the primary winding
 - (ii) the maximum current that can be carried by the secondary winding
 - (iii) the turns-ratio $N_s : N_p$
 - (iv) the number of similar units to be operated in parallel to satisfy a total demand of 440MVA.

(9 marks)

- (b) A 100 KVA distribution transformer consists of star-connected, 3-phase windings on a shell-type iron core. Calculate
 - (i) the primary line voltage, assuming the primary line current to be 18.18A.
 - (ii) the primary phase voltage
 - (iii) the value of primary phase current

(11 marks)

Question THREE

- (a) Compare and contrast the wound-rotor induction motor and the squirrel-cage-rotor induction motor. (2 marks)
- (b) State any **THREE** applications of 3-phase induction motors. (3 marks)
- (c) A 50Hz, 4-pole, 3-phase induction motor has a rotor current of frequency 2Hz. Calculate:
 - (i) the per-unit slip
 - (ii) the speed of the motor.

(7 marks)

- (d) Describe the following parts of a 3-phase induction motor:-
 - (i) stator
 - (ii) rotor
 - (iii) slip-rings
 - (iv) fan.

(8 marks)

Question FOUR

- (a) Distinguish between a 3-phase synchronous motor and a 3-phase alternator. (2 marks)
- (b) State **THREE** applications of 3-phase synchronous motors. (3 marks)
- (c) Explain
 - (i) the term **synchronous capacitor**.
 - (ii) why a synchronous machine is called a **doubly-excited machine**.

(15 marks)

Question FIVE

Explain how electrical system faults can be caused by the following:-

- (i) Power failure
- (ii) Over-voltage
- (iii) Wrong operating procedure
- (iv) Unfavourable working environment

(20 marks)