TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology

DEPARTMENT OF MEDICAL ENGINEERING

DIPLOMA IN MEDICAL ENGINEERING (DME 315)

EEP 2250
ELECTRICAL MACHINES AND UTILISATION I

END OF SEMESTER EXAMINATIONS

YEAR 2 SEMESTER 1

SERIES:SEPT. , 2017

TIME: 2 HOURS

INSTRUCTIONS:

1. You should have the following for this examination:
   - Answer Booklet

2. This paper consists of **FIVE** questions
3. Question **ONE** is **COMPULSORY;** attempt any other **TWO** Questions.
4. Do not write on the question paper.
5. This paper consist of **THREE** printed pages.

Question ONE

(a) Distinguish between **d.c motor** and **d.c. generator.** **(2 marks)**

(b) State how the following can be varied:

(i) Speed of d.c. motor
(ii) Output voltage of d.c. generator

(2 marks)

(c) A 220V d.c. machine has an armature resistance of 0.5Ω. If the full-load armature current is 20A, calculate the induced e.m.f. when the machine acts as:

(i) A generator
(ii) A motor

(6 marks)

(d) Explain the function of:

(i) Armature
(ii) Yoke
(iii) Commutator
(iv) Brushes
in d.c. machines

(20 marks)

Question TWO

(a) Define the term **universal motor.** **(1 mark)**

(b) State any **TWO** applications of single-phase induction motor. **(2 marks)**

(c) Explain why the single-phase induction motor is inherently not self-starting.
(5 marks)

(d) A single-phase electric motor operating off a 400V, 50Hz supply is developing 10kW with an efficiency of 84% at a power-factor of 0.7 lagging. Calculate:

(i) The true input power
(ii) The reactive input power
(iii) The apparent input power
consumed by this motor.

(12 marks)

Question THREE

(a) Define the term **transformer.** **(1 mark)**

(b) State:

(i) **TWO** methods for cooling
(ii) **TWO** main power losses
in single-phase transformers.

(4 marks)

(c) Explain why the transformer is described as a machine yet it has no moving parts.
(5 marks)

(d) An ideal 50kVA, 100V/250V, 50Hz single-phase transformer has 500 turns on the primary. Calculate:

(i) The number of secondary turns
(ii) The primary and secondary full-load currents
(iii) The maximum value of core flux

(10 marks)

Question FOUR

Explain how the selection of a motor for industrial drive is influenced by:

(i) Power supply available
(ii) Cost
(iii) Environmental conditions
(iv) Starting requirements

(20 marks)

Question FIVE

With the aid of a labelled diagram, explain the principle of operation of d.c. motor. **(20 marks)**