



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: DECEMBER, 2015

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) Define the term **d.c generator**. (1 mark)
- (b) State how the direction of rotation of d.c. motor can be reversed. (1 mark)
- (c) With the aid of a labelled diagram, describe the FOUR main parts of a d.c. motor. (9 marks)
- (d) A d.c. motor is coupled to a d.c. generator. The motor of efficiency 80% is supplied at 400V d.c. If the generator output is 20kW at an efficiency of 75%, calculate the input current to the motor. (9 marks)
- (e) Explain the function of the following in d.c. machines:
- (i) Armature
 - (ii) Yoke.
- (10 marks)

Question TWO

- (a) Define the term **electric motor**. (1 mark)
- (b) Describe the following parts of single-phase motor: (6 marks)
- (i) Stator
 - (ii) Rotor.
- (4 marks)
- (c) With the aid of labelled electric circuit diagram, explain the principle of operation of a single-phase induction motor. (6 marks)
- (d) The full-load speed of a 6-pole, single-phase induction motor operating from a 50Hz supply is 956r.p.m. Calculate:
- (i) the slip speed
 - (ii) the percent slip
 - (iii) the rotor frequency.
- (9 marks)

Question THREE

- (a) State any **TWO** applications of single-phase transformers. **(2 marks)**
- (b) Explain why the transformer is described as a machine yet it has no moving parts. **(5 marks)**
- (c) Describe the following parts of a single-phase transformer:
- (i) Primary winding
 - (ii) Secondary winding
 - (iii) Core.
- (6 marks)**
- (d) The **volts-per-turn** of a certain single-phase transformer is 1.7. The transformer has step-down ratio of 3825V to 255V. Calculate:
- (i) The number of turns in primary winding
 - (ii) The number of turns in secondary winding
 - (iii) The secondary current if the primary current is 12A
- (7 marks)**

Question FOUR

- (a) Distinguish between the following types of motor enclosures:
- (i) Flame-proof
 - (ii) Drip-proof.
- (6 marks)**
- (b) State:
- (i) Any **THREE** advantages of electric drive over mechanical drive.
 - (ii) Any **THREE** methods of transmitting motor torque to the load.
- (6 marks)**
- (c) Explain how the following factors influence the selection of driving motor.
- (i) Electrical characteristics
 - (ii) Mechanical considerations
 - (iii) Cost.
- (12 marks)**

Question FIVE

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