### TECHNICAL UNIVERSITY OF MOMBASA

## Faculty of Engineering and Technology Department of Electrical and Electronic engineering

#### **UNIVERSITY EXAMINATION:**

# Diploma in Electrical Power Engineering (DEPE 6) ELECTRICAL SWITCHGEARAND PROTECTION EEP 2305

END OF SEMESTER IV EXAMINATION
SERIES: MAY 2016
TIME: 2 HOURS

#### **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.

Ou	estion	<b>ONE</b>
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- (a) State TWO applications of differential relays (2 marks)
- (b) Explain the following
  - (i) Relay coordination in a protective system
  - (ii) THREE ways of achieving time delay in inverse time relays

8 marks

(c) Explain the operational difference between an electromechanical and a solid state relay

4 Marks

- (d) State three
  - (i) Disadvantages of an EMR relay as compared to the SSR relay.
  - (ii) Merits of SSR relay

6 marks

#### Question 2

- (a) Explain
  - (i) how an arc is initiated in a circuit breaker
  - (ii) methods used to extinguish it.

8 marks

- (b) Define the following as applied to circuit breakers:
  - (i) Breaking capacity
  - (ii) Recovery voltage
  - (iii) Restriking voltage

6 marks

- (c) Explain;
  - (i) Current chopping in CB's
  - (ii) Why self blast oil circuit breakers take longer to interrupt overloads than short circuits.

6 marks

#### **Question 3**

- (a) Explain:
  - (i) Resistance switching
  - (ii) Electronegativity of SF<sub>6</sub> gas
  - (iii) Characteristics of SF<sub>6</sub> gas making it suitable for protection 8 marks
- (b) (i) State the purpose of the resistor- capacitor snubber circuit network in an SSR
  - (ii) Draw the time /current characteristic of an inverse current relay
  - (iii)Explain three ways in which time delay in inverse time relays is achieved.

(12 marks)

#### **Question FOUR**

- (a) State the
  - (i) failures a turbo alternator is likely to be subjected to.
  - (ii) cause of alternator over speed and how it is protected against.
  - (iii)main stator winding faults

(9 marks)

- b) Explain the
  - (i) limitations of merz price protection
  - (ii) working principle of distance relays

(11 marks)

#### **Question FIVE**

- (a) State the faults that an alternator can be subject to in a power system (8 marks)
- (b) State:
  - (i) The function of oil in a circuit breaker
  - (ii) Hazards of oil when used as an arc quenching medium (4 marks)
- (c) State:
- (i) The advantages of minimum oil CB over bulk oil CB
- (ii) The disadvantage of MOCB over bulk oil circuit breaker
- (iii) Advantages of air blast circuit breaker over oil circuit breakers
- (iv) Demerits of using air as an arc quenching medium

(8 marks)