TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology

Department of Electrical and Electronic engineering

Diploma in Electrical Power Engineering

ELECTRICAL SWITCHGEAR AND PROTECTION

EEP 2305

SERIES: AUGUST 2019

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

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Question ONE

(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 TWO

(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) State the faults that an alternator can be subject to in a power system

(8 marks)

(b) An 11 kv, IO-MVA, three-phase. star-connected alternator is earthed through a non- inductive resistor of *5* . An earth leakage relay connected to a current transformer in the earthing connection is set to operate when the current reaches 30 per cent of full load. Determine the percentage of the alternator winding likely to be unprotected against zero impedance earth faults.

(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) Explain:

(i) Resistance switching
(ii) Electronegativity of SF_6 gas
(iii) Characteristics of SF_6 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)