University Examinations 2013/2014

THIRD YEAR, SECOND SEMESTER EXAMINATION FOR DIPLOMA IN ELECTRICAL ENGINEERING

EEE 0246: ELEMENTS OF ELECTRICAL POWER SYSTEMS III

DATE: APRIL 2014   **TIME: 1 ½ HOURS**

INSTRUCTIONS: *Answer question **one** and any other **two** questions*

QUESTION ONE – (30 MARKS)

(a) Describe a protective system.   (3 Marks)

(b) Describe three qualities of a protective system.   (6 Marks)

(c) With the aid of a sketch describe the shaded pole as used in protection.   (6 Marks)

(d) A 5000KVA, 6 600V, star connected alternator has a synchronous reactance of 20ohms per phase and 0.5ohm resistance. It is protected by a merzt price balanced current system which operates when out of balance current exceed, 30% of load current. Determine what proportion of alternator winding is unprotected if the star point is earthed through a resistance of 6.5ohms.   (10 Marks)

(e) Describe differential protection.   (3 Marks)

(f) Explain what is meant by I.D.M.T relay in power protection.   (2 Marks)

QUESTION TWO – (15 MARKS)

(a) With the aid of a diagram describe Bulcholz transfer protection.   (7 Marks)

(b) With the aid of a diagram explain differential protection of generators.   (6 Marks)

(c) State two types of protection.   (2 Marks)

QUESTION THREE – (15 MARKS)

(a) Describe the following terms as used in protection
- (i) Pick up current
- (ii) Current setting
- (iii) Graded time protection
- (iv) Distance/time protection   (4 Marks)

(b) The neutral point of a three phase 20mVA, 11KV alternator is earthed through a resistance of 5 ohms, the relay is set to operate when there is an out of balance current of 1.5A. The C.T have a ratio of 1000/5. What is the percentage of winding protected? Also calculate the earthling resistance required to protect 90% of the winding.

               (9 Marks)

(c) Describe the operation of electromagnetic relay as used in protection.   (2 Marks)

QUESTION FOUR – (15 MARKS)

(a) With the aid of a diagram describe time-distance impedance relay.   (6 Marks)

(b) Briefly explain the function of the following device in a protective system. (6 Marks)
- (i) Protective relay
- (ii) Circuit breaker
- (iii) Current transformer

(c) Describe the principle of mertz price protection.   (3 Marks)