TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering & Technology in Conjunction with Kenya Institute of Highways and Building & Technology (KIHBT)

DEPARTMENT OF ELECTRICAL & ELECTRONIC ENGINEERING

HIGHER DIPLOMA IN ELECTRICAL ENGINEERING

EEP 3204: ELECTRICAL POWER SYSTEMS III

END OF SEMESTER EXAMINATION
SERIES: MAY 2015
TIME ALLOWED: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*

This paper consists of **FIVE** questions. Answer any **THREE** questions
This paper consists of **THREE** printed pages

Question One

a) With reference to overhead lines explain the following:
   (i) Feranti effect
   (ii) Corona formation
   (iii) Corona effects
   (iv) How corona effects can be reduced **(12 marks)**

b) A three phase overhead line comprising three conductors each having a diameter of 2.54cm and symmetrically spaced 1.83m between centres has an irregularly factor of 0.8. If the atmosphere pressure is 73.7cm of mercury and the temperature is 15.6^{o}C. Determine the disruptive critical voltage **(8 marks)**

Question Two

a) (i) State the necessary characteristics of a protective system.

   (ii) Distinguish between a unit and non unit protective system **(5 marks)**

b) Define the following protection terms:
   (i) Breaking capacity
   (ii) Recovery voltage
   (iii) Restriking voltage **(6 marks)**

c) Explain:
   (i) Current chopping in circuit breakers
   (ii) Why self blast oil circuit breakers take longer to interrupt overloads than short circuits **(5 marks)**

d) State FOUR advantages of SF_6 over air in arc quenching **(4 marks)**

Question Three

a) State the objective of earthing the neutral of a high voltage system **(4 marks)**

b) State why the neutral of a High voltage system is connected directly to earth while that of a medium voltage system is connected to earth through a reactor or a tuned reactor **(5 marks)**

c) (i) With the aid of a diagram, describe the method of earthing the neutral through a voltage transformer
   (ii) Each conductor of a 33KV three phase 50Hz overhead line has a capacitance to earth of 0.4μF. Determine the tuned inductance of the coil to earth it **(11 marks)**

Question Four

a) (i) Distinguish between primary protection and back up protection.

   (ii) Define relay pick up current

(iii) State TWO applications of differential relays

(iv) Explain the use of relay coordination **(10 marks)**

b) Explain:

(i) Limitations of merz price protection

(ii) The working principle of distance relays **(10 marks)**

Question Five

a) (i) Define a high voltage transient (surge)

(ii) State FIVE causes of high voltage transients

(iii) Draw the wave form of a typical High voltage transient **(10 marks)**

b) With reference to voltage surges, explain the following:

(i) Rod gap diverter

(ii) Horn gap diverter

(iii) Expulsion type diverter

(iv) Surge absorber