TECHNICAL UNIVERSITY OF MOMBASA

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

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

UNIVERSITY EXAMINATION FOR 2017/2018:

HIGHER DIPLOMA IN TECHNOLOGY
ELECTRICAL POWER ENGINEERING

EEP 3204: ELECTRICAL POWER SYSTEMS III

END OF SEMESTER EXAMINATION

SERIES: DECEMBER 2017

TIME: 2 HOURS

DATE: Pick DateSelect MonthPick Year

Instructions to Candidates

You should have the following for this examination
-Answer Booklet, examination pass and student ID
This paper consists of **FIVE** Questions; each question carries 20 Marks. Attempt any **THREE** Questions.
Do not write on the question paper.

Question ONE

(a) Explain why neutral of a high voltage system is usually solidly grounded while that of a medium voltage is grounded through a resistor or tuned reactor. **(3 marks)**

(b) With the aid of a diagram explain the method of earthing through a voltage transformer and state its advantages **(5 marks)**

(c) (i) Explain the Petersen coil methods of neutral grounding and state its advantage.

(ii) A 33KV three phase overhead line has each of its conductors having a capacitance to earth of 0.4 microfarad. Neglecting the power loss in the coil Determine the inductance and KVA rating of a correctly tuned arc suppression coil (Petersen coil)

(12 marks)

Question TWO

(a) State FIVE methods of power system voltage control **(5marks)**

(b) Explain

(i) The limitation of voltage control by variation of excitation at send end.

(ii) the use of a synchronous modifier in a power system

(5 marks)

(c) A 3Φ overhead line has a per phase resistance of 6Ω and reactance of 20Ω. The sending end voltage is maintained at 66KV and the receive end is maintained at 66KV by a synchronous modifier. The receive end power is 75MW at 0.8pf lagging. Determine the MVAr capacity of the synchronous modifier. **(10 marks)**

Question THREE

a. Explain the following with reference to overhead transmission lines

i. Feranti effect

ii. Corona formation

iii. corona effects

iv. Methods of minimizing corona effects

(10 marks)

b. Derive the expression for the disruptive critical voltage V_o **(5 marks)**

c. A three phase overhead line comprising three conductors each of diameter 2.54 and symmetrically spaced 1.83M between centres has an irregularity factor of 0.8. If the atmospheric pressure is 73.7 cm of mercury and the temperature is 15.6^0 C. Determine the disruptive critical voltage **(5 marks)**

Question FOUR

a. i. State the necessary characteristics of a protective system,

ii. Distinguish between a unit and non-unit protective system. **(6 marks)**

b. i. Factors determining arc resistance

ii. Factors that maintain an arc between contacts

(6 marks)

c. Explain the methods of arc extinction and how each is achieved. **(6 marks)**

d. Explain why a self-blast oil circuit breaker takes much longer to extinguish the arc developed when breaking low currents than when high fault currents are interrupted.

(2 marks)

Question FIVE

a. State the causes of high voltage surges in transmission lines. **(3 marks)**

b. Explain a travelling wave and how it develops on an overhead line **(4 marks)**

c. Explain why a transmission line is terminated to station apparatus through a short length of cable. **(3 marks)**

d. An overhead line with inductance and capacitance per km of 1.24 mH and 0.087 ρF respectively is connected in series with an underground cable having inductance and capacitance of 0.185mH/km and 0.285 jF/km. Calculate the values of transmitted and reflected waves of voltage and current at the junction due to a voltage surge of 110 kV travelling to the junction along the

   i. Line towards the cable

   ii. Cable towards the line.

(10 marks)