TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology

Department of Electrical and Electronic engineering

UNIVERSITY EXAMINATION:

Diploma in Electrical Power Engineering (DEPE 4)
ELECTRICAL POWER SYSTEMS I
EEP 2205

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

Question ONE

(a)   State:
        (i)   **TWO** reasons that make transmission of electrical energy by underground cables
                unsuitable.
        (ii)   **THREE** essential properties of each of the following in overhead line transmission:
                (I)   Conductors
                (II)   Line supports
                (III)   Insulators

                                                                                    (11 marks)

(b)   Define the following terms:
                (i)   Load factor
                (ii)   Plant use factor
                (iii)   Plant capacity factor i;,r.

                                                                                    (6 marks)
State **THREE** items of information derived from load curves.   (3 marks)

Question TWO

(a)   (i)   Explain why an excitation system is necessary.

(ii)   State the characteristics required of an excitation system.

(iii)   State the factors determining amount of excitation required.

(iv)   Explain why individual exciters are preferred to centralized system.

                                                                                    (10 **marks)**

(b)   With the aid of a diagram describe the a.c excitation system with thyristor amplifiers   (10 **marks)**

Question THREE

(a)   Explain the following in a generating power plant:

                (i)   Super heater
                (ii)   Economizer

                                                                                    (4 marks)
(b)   State the draw backs of a nuclear power plant.   (4 marks)
(c)   State the roles of voltage regulators in a power plant.   (3 marks)

(d)   Explain the following in a hydroelectric generating station:

                (i)   Spill ways
                (ii)   Surge tank
                (iii)   Penstock

                                                                                    (9 marks)

Question FOUR

(a)   State FOUR factors:

   (i)   Affecting sag in an overhead line
   (ii)   That determine the type of supports for overhead lines

(8.marks)

(b)   An overhead transmission line at a river crossing is supported by two towers of height 30m and 90 metres respectively. The tower bases are at the water level.   The horizontal distance between the towers is *500m*. The conductor weighs 1.5kg per metre length and has an ultimate tension of 62.78KN and safety factor is 4.

   Determine:

   (i)   Sag at the *lower support*
   (ii)   Sag from the higher *support*
   (iii)   Minimum clearance of the conductor and water level

(12 marks)

Question FIVE

(a)   Explain:

   (i)   Why potential distribution over an insulator string is not uniform.
   (ii)   **THREE** methods of improving the insulator string potential distribution.

(8 marks)

(b)   A string of six suspension insulators is used to support one conductor of a 66kV three phase overhead line. The air capacitance between each cap-pin junction and the earthed metal tower is one tenth of the capacitance of each unit.

   Determine:

   (i)   The voltage distribution
   (ii)   The string efficiency

(12 marks)