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 3107: ELECTRICAL POWER SYSTEMS I

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) State FOUR:
   (i) Sources of energy
   (ii) Form of energy other than electrical energy **(8 marks)**

b) (i) Explain power station load curves
   (ii) State FOUR items of information derived from load curve **(7 marks)**

c) (i) Draw backs of using ONE large unit with capacity to meet the load demand in a station

   (ii) Consideration made in selecting the number of generating units (sets) in a station **(5 marks)**

Question Two

a) Define the following electric power generation items:
   (i) Load factor
   (ii) Plant use factor
   (iii) Plant capacity factor **(6 marks)**

b) Distinguish between the following in generating stations
   (i) Essential auxiliaries
   (ii) Non essential auxiliaries **(4 marks)**

c) A power station with an installed capacity of 160mw runs two 50mw units for 800 hours per annum and one 30mw unit for 1200 hours per year. The station output is 600 x 10^6kw per year. Determine:
   (i) Station load factor
   (ii) Station plant use factor
   (iii) Plant capacity factor
   (iv) Diversity factor **(10 marks)**

Question Three

a) Explain the following in Hydro electric stations:
   (i) Spill ways
   (ii) Surge tank
   (iii) Automatic isolating valves **(6 marks)**

b) State:
   (i) The role of an excitation system
   (ii) Essential characteristics of an excitation system of excitation necessary **(8 marks)**

c) With the aid of a schematic diagram, describe the a.c excitation system with thyristor amplifier

(6 marks)

Question Four

a) State THREE essential properties of each the following in overhead transmission lines:
   (i) Conductors

(ii) Insulators
(iii) Line supports **(9 marks)**

b) (i) State FOUR factors affecting sag in overhead lines
(ii) A transmission line has a span of 150m between level supports. It carries a conductor having a cross sectional area of $2cm^2$ and has a specific gravity of $9.9g/cm^3$.

The wind pressure is 14.75 Newtons per metre length. The tension in the conductor is 19.62KN. Determine:
(i) The slant sag
(ii) The vertical sag **(11 marks)**

Question Five

a) Explain the following in reference to cables:
(i) Skin effect
(ii) Void formation
(iii) Three methods used to minimize or delay void formation
(iv) Effect of voids **(10 marks)**

b) State THREE ways in which maximum stress on a cable dielectric can be reduced **(3 marks)**

c) The conductor of a 100KV single core lead sheathed cable having graded insulation has a conductor diameter of 2cm. The internal sheath radius is 4cm. The first centimeter of radial thickness of insulation has a relative permittivity of 3 and that of the remainder is 5. Determine the maximum and minimum values of stress for:
(i) Each dielectric
(ii) A homogenious dielectric for each insulator **(7 marks)**