MOI UNIVERSITY

SCHOOL OF ENGINEERING

DEPARTMENT OF ELECTRICAL AND COMPUTER ENG.

2010/2011 ACADEMIC YEAR

COURSE TITLE: BASIC ELECTRICAL POWER .

COURSE TITLE: ECE 272

TIME:3 HRS

 Instructions:Answer any **five** of the following **seven** questions

QUESTION ONE

1 a)(i)Explain the essential factors that influence the choice of site for a hydro-electric plant.   **(4 mrks)**
    (ii)Explain the functions of the following; superheater,economizer,air-preheater condenser and boiler **(5 mrks)**

  b) A hydro-electric power station has reservoir area of 2.4 km^2 and capacity 5 x 10^6 M^3.The effective head of water is 100M.The penstock,turbine and generator efficiencies are respectively 95%,90% and 85%.Find;
      (i)the total electrical energy that can be generated from the power station.
      (ii)if a load of 15,000 kw has been supplied for 3hrs,find the fall in reservoir level.   **(5 mrks)**

QUESTION TWO

2 a)Explain the meaning of the following terms as applied to power generation;
                (i)Load Curve.
                (ii) Maximum Demand.
                (iii) Load Factor.
                (iv)Diversity Factor.   **(4 mrks)**
 b)A load having a maximum value of 150MW can be supplied either by hydro electric station or steam power plant. The costs are as follows;

Plant	Cost/kw installed	Operating cost/kwh	Interest
Steam Plant	Ksh.1600	60 Cts	7%
Hydro Plant	Ksh.3000	30 Cts	7%

Calculate the minimum load factor above which the hydro-electric plant will be more economical.

                                                                          (6 mrks)
c)Explain *two* advantages of having a high load factor.   **(4 mrks)**

QUESTION THREE

3 a)Give *four* desirable characteristics of a tariff.   **(4 mrks)**
  b)Calculate annual bill of a customer whose maximum demand is 100kw,p.f = 0.8 lagging and a load
    factor of 60%.The tariff used is Ksh.75 per Kva of maximum demand plus 15 cts per kWh consumed.
                                                                          (3 mrks)
  c)Explain the following methods of tariff;
                (i)Block rate
                (ii)Two-part tariffs   **(2 mrks)**
  d)A generating station has two 1000 kw diesel-generator sets.The load is estimated to reach a maximum demand of 2500 kw after two years with an increase of 5.5 x 10^6 units over the present value.To meet this demand,the following two alternatives are available:
        (i)Purchasing one more set of 1000 kwat Ksh.400 per kw.The annual interest and depreciation of the
        new   set are 10% of the capital investment. The cost of generation for the station is Ksh. 75 per kw
        maximum demand plus 5 cts per kwh.
        (ii)Purchasing bulk power from the grid supply at Ksh.120 per kw maximum demand plus 3cts per kwh.
  Find which alternative is cheaper and by how much?   **(5 mrks)**

QUESTION FOUR

4 a)Explain *four* disadvantages of low power factor. **(4 mrks)**

 b)A 3-phase,50Hz ,400v motor develops 74.6 kw,the power factor being 0.75 lagging and efficiency 93%.A bank of capacitors is connected in delta across the supply terminals and the power factor raised to 0.95 lagging.Each of the capacitance units is built of 4 similar 100v capacitors.Determine the capacitance of each capacitor. **(6 mrks)**

 c)Show that for consumer taking power of P Kw at a power factor $\cos\Phi_1$ charged at Ksh *A* per kVA maximum demand plus a flat rate per kWh,the most economical power factor after installing a power factor improvement equipment should be;

$$\cos\Phi_2 = \sqrt{1-(B/A)^2}$$

 Where $\cos\Phi_2$ = power factor after correction

 B = the cost of per Kvar of the p.f correction equipment. **(4 mrks)**

QUESTION FIVE

5 a)With respect to phases name *any four* systems that are available for A.C distribution; **(4 mrks)**

 b)Prove mathematically that high transmission voltage have the following advantages;

 (i)reduced volume of conductor material.

 (ii)decreased percentage line drop.

 (iii)increased transmission efficiency. **(6 mrks)**

 c)An overhead,single phase-phase transmission line delivers 1100Kw at 33kV at 0.8 p.f lagging.The total resistance of the line is 10Ω and a total inductive reactance is 15 Ω.Determine;

 (i)transmission efficiency

 (ii)sending-end voltage

 (iii)sending-end p.f. **(4 mrks)**

QUESTION SIX

6 a)With the help of a neat sketch give a brief outline of a typical A.C power supply scheme showing the following parts;

 (i)generating station

 (ii)primary transmission

 (iii)secondary transmission

 (iv)primary distribution **(7 mrks)**

 (v)secondary distribution

 b)Give **any four** advantages of high voltage D.C transmission over high voltage A.C transmission. **(4mrks)**

 c) Give **any three** disadvantages of high voltage D.C transmission over high voltage A.C transmission.

(3 mrks)

QUESTION SEVEN

7 a)Outline **three** forms of resistance welding. **(6 mrks)**

 b)With the help of a well labeled diagram explain the working principle of fluorescent mercry-vapour lamps

(5 mrks)

 c)Explain the formation of electric arc. **(3 mrks)**