SECOND PART

Answer the following questions *(Total for this Part: 55 Marks)*

Fourth Question (Total 20 marks)

4-1) A generating station supplies the following loads: **15000** kW, **8500** kW, **6000** kW, and **450** kW. The station has a maximum demand of **22000** kW. The annual load factor of the station is **48%**. Calculate:

(a) the numbers of units supplied annually
(b) the diversity factor,
(c) the demand factor. **(6 Marks)**

4-2) An over head line is erected across a span of **250** m. The conductor has a diameter of **1.42** cm, and has a dead weight of **1.09** kg/m. The line is subjected to wind pressure of **37.8** kg/m^2 of the projected area. The radial thickness of ice is 1.25 cm. If the maximum working stress is **1050** kg/m^2, and the ice weight is **913.5** kg/m^3, Calculate:

(a) the sag in an inclined direction
(b) the sag in a vertical direction
(c) The maximum sag. **(7 Marks)**

4-3) A string of **5** suspension insulators is to be graded to obtain uniform distribution of voltage across the string. If the pin to earth capacitances are all equal to **C** and the mutual capacitance of the top unit is **12 C**, ***find*** the mutual capacitance of each unit in terms of C. **(7 Marks)**

Fifth Question (Total 19 marks)

5-1) Compare between different methods used to improve power factor in power systems **(5 Marks)**

5-2) What are the main materials used in constructing insulators used in transmission lines? What are the advantages and disadvantages of each material?
In your opinion what is the best material used to fabricate these insulators? **(5 Marks)**

5-3) Write (in steps) a practical method used to calculate the capacitance of a three-core cable. **(5 Marks)**

5-4) Evaluate formulas of maximum and minimum stress in an underground cable. **(4 Marks)**

أسئلة هذا الجزء من صفحتين من فضلك اقلب الورقة

Sixth Question (Total 16 marks)

6.1) **Give Short Answers for Five Only** **(10 Marks)**

1. Mention the advantages of underground cables over overhead lines.
2. What are the components of a high voltage underground cable?
3. List the various methods for improving string efficiency.
4. What is the purpose of insulator in over head transmission lines?
5. Mention the main causes for failure of insulators.
6. Mention the advantages of suspension type insulators over pin type insulators.

6-2) **Choose the right answer:** **(6 Marks)**

انقل رقم السؤال ورقم اجابته الصحيحة فقط فى كراسة الاجابة

1- In aluminum conductors steel reinforced, the insulation between aluminum and steel conductors is
   (A) any insulator
   (B) bitumen
   (C) insulin
   (D) no insulation is required.

2- Consumers having low power factor equipment are advised to install
   (A) tap changing transformer
   (B) capacitor bank
   (C) synchronous condensers
   (D) none of the above.

3- The effect of ice deposition on conductor is
   (A) increased skin effect
   (B) reduced corona losses
   (C) increased weight
   (D) reduced sag.

4- The disadvantage of transmission lines as compared to cables is
   (A) exposure to lightening
   (B) exposure to atmospheric hazards like smoke, ice, etc.
   (C) inductive interference between power and communication circuits
   (D) all of the above.

5- Guard ring transmission line
   (A) improves power factor
   (B) reduces earth capacitance of the lowest unit
   (C) reduces transmission losses
   (D) improves regulation.

6- During storm the live conductor of public electric supply breaks down and touches the earth. The consequences will be
   (A) supply voltage will drop
   (B) supply voltage will increase
   (C) current will flow to earth
   (D) no current will flow in the conductor.

With my Best Wishes

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13/6/2012

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Dept. of Electrical Engineering
Power System 1

Date: 13-6-2012
Time: 3 hours for 2 part
Part 1

Answer All the following Questions, Exam is in 2 pages

Question 1 [20]

(a) Draw with the help of equations the phasor diagram of the medium transmission line represented as a T-model supplying a lead power factor load.

(b) Find the inductance and the capacitance per kilometer of a single phase transmission line as shown in Figure 1, radius of each conductor is 2 cm.

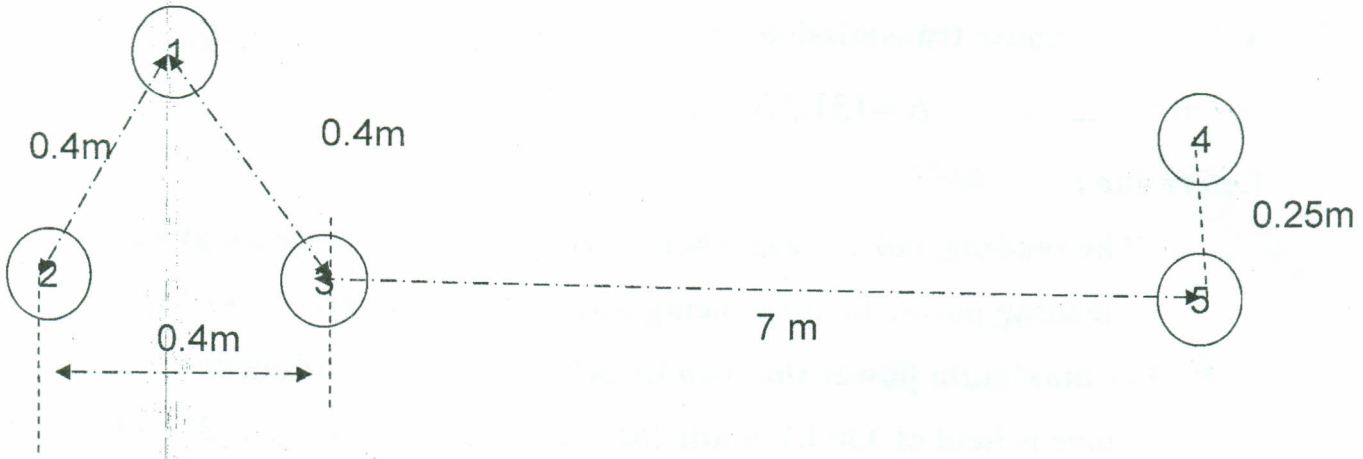

Figure 1

Question 2[20]

(a) Knowing the values of V_s and I_s and the A, B, C, and D parameters of a transmission line, how can we calculate V_r and I_r ?

if "s" denotes to sending end and "r" denotes to receiving end.

(b) A 120 MW, 132 kV, 0.85 lagging power factor load is connected at the receiving end of a 3-phase transmission line considered as a medium[]- - model with the following parameters:

$r = 25\Omega, \quad X_L = 85\Omega, \quad Y = 8*10^{-4}\, moh$

I) Find the A,B, C, D parameters of the line,

II) Calculate the sending end voltage, current, an d power factor,

IV) Determine the voltage regulation and the efficiency of the line.

Question 3 [15]

A 320 kV, 3-phase transmission line has the following parameters:

$A = 0.87\angle 2^o \qquad B = 131\angle 70^o\ \Omega$

Determine :

a) The sending end voltage when a load of 300 MW, 320 kV at 0.6 leading power factor is being delivered at the receiving end,

b) The maximum power that can be delivered if the sending end voltage is held at 330 kV while the receiving end voltage is 320 kV,

c) The additional MVAR that has to be provided when supplying 120% of the full load at the same power factor to keep the sending end voltage at 330kV.

With my best wishes
Dr. SaharKaddah