SECOND PART

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

Fourth Question (Total 21 marks)

4) Give **Short Answers** for **Only Seven** questions (21 Marks)

أجب فقط على ٧ أسئلة مما يلى ولن يلتفت بأى حال إلى الاجابات الزائدة ...
عند الاجابة اكتب رقم السؤال كما هو موجود فى ورقة الأسئلة

1. Enumerate the different types of insulators used for overhead transmission lines?
2. What are the purposes of insulator in over head transmission lines?
3. Mention the advantages of suspension type insulators over pin type insulators.
4. List the various methods used to improve power factor in power systems
5. What are the components of a high voltage underground cable?
6. What is guard ring?
7. Mention the main causes for failure of insulators.
8. Mention the advantages of underground cables over overhead lines.
9. List the various methods for improving string efficiency.

Fifth Question (Total 24 marks)

5) Answer Only Four Questions

أجب فقط على ٤ أسئلة مما يلى ولن يلتفت بأى حال إلى الاجابات الزائدة

5-1) A generating station is supplying Four regions whose peak loads are **20 MW**, **10 MW**, **16 MW**, and **14 MW**. The diversity factor at the station is **1.5** and the average annual load factor is **0.6** Calculate:

A) The maximum demand on the station.
B) The annual energy supplied by the station. **(6 Marks)**

5-2) A **66 kV** concentric cable with two inter-sheaths has a core diameter **1.8 cm**. Dielectric **3.5 mm** thick constitutes the three zones of insulation. Determine the maximum stress in each of the three layers if **20 kV** is maintained across each of the inner two. **(6 Marks)**

5-3) 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. **(6 Marks)**

☞ لاحظ أن أسئلة هذا الجزء من ٣ صفحات ☜

5-4) A factory takes a steady load of **200 KW** at a lagging power factor of **0.8**. The tariff is **100** $ per KVA of maximum demand per annum plus **5** cent per KWh. The phase advancing plant costs **500** $ per KVAR and the annual interest and depreciation together amount to **10%, Find**:

a) The value to which the power factor be improved so that annual expenditure is minimum.

b) The capacity of the phase advancing plant.

c) The new bill for energy, assuming that the factory works for **5000** hours per annum. **(6 Marks)**

5-5) 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. **(6 Marks)**

Sixth Question (Total 10 marks)

6) **Choose the Correct Answer:** **(10 Marks)**

انقل رقم السؤال ورقم اجابته الصحيحة فقط فى كراسة الاجابة

1. Which of the following statement is correct?

(A) Ice on conductors improves power factor

(B) Wind pressure is taken to act in a direction at right angles to that for ice

(C) Wind pressure and ice on conductors together improve regulation of power transmitted.

2. ACSR conductor implies

(A) All Conductors Surface Reinforced

(B) Aluminum Cupper Steel Reinforced

(C) Aluminum Conductor Steel Reinforced

3. In case the height of transmission tower is increased

(A) the line capacitance and inductance will not change

(B) the line capacitance will decrease but line inductance will decrease

(C) the line capacitance will decrease and line inductance will increase

(D) the line capacitance will decrease but line inductance will remain unaltered.

4. In ACSR conductors, due to Steel the resistance of conductor .....

(A) increases

(B) decreases

(C) unchanged

☞ لاحظ أن أسئلة هذا الجزء من ٣ صفحات ☜

5. A string efficiency of 100% implies that
   (A) shunt capacitance is 1 MF
   (B) potential across each disc is same
   (C) potential across each disc is zero
   (D) one of the insulator disc is shorted.

6. Between two supports, due to sag the conductor takes the form of
   (A) catenary
   (B) triangle
   (C) ellipse
   (D) semi-circle.

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

8. 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.

9. Initial cost of synchronous condensers is ..... as compared to that of shunt capacitors.
   (A) low
   (B) high
   (C) same

10. String efficiency can be improved by
   (A) using Longer cross arm
   (B) grading the insulator
   (C) using a guard ring
   (D) any of the above.

With my Best Wishes
Prof. Dr. Magdi El-Saadawi
4/6/2013

Mansoura University
Faculty of Engineering
Department: Electrical Eng.
Year/Level : 2nd grade

Course: Power Systems 1
Code :EE2224
Time : 3 hours
Date : 4/6/2013

Please, answer All the following Questions, Exam is in 2 pages

Question 1 [20]

(a) Starting from the principles, find the flux linkage due to the flux between 2 points external to a conductor carrying an alternating current.

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

(c) Find the inductance and the capacitance per kilometer of a three phase bundle conductor line with two conductors per phase as shown in Figure 1. The radius of each conductor is 2 cm and a, $\underline{a}$ are the components of phase A. b, $\underline{b}$ are the components of phase B. c, $\underline{c}$ are the components of phase C.

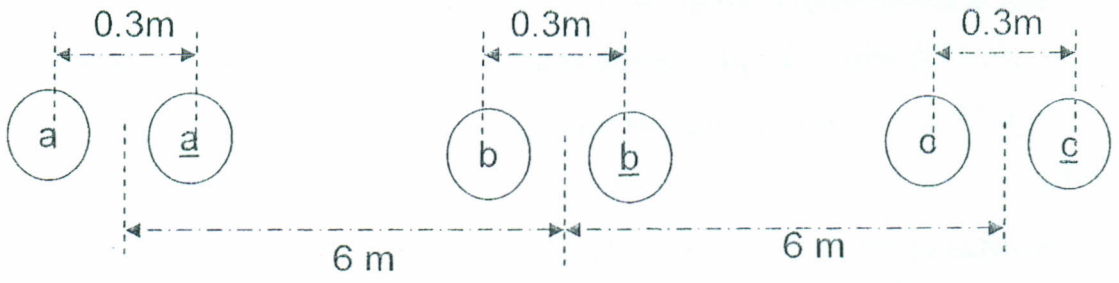

Figure 1

Question 2 [20]

(a) Compare in a table between the short, medium T, medium ∏, long transmission lines. This comparison should include the length, assumptions, and A,B, C, D parameters of the line.

(b) A 60 MW, 132 kV, 0.85 lead power factor load is connected at the receiving end of a 140 km, 3-phase transmission line considered as T- model with the following parameters per km:

$$r = 0.2\Omega, \quad L = 1.4mH, \quad C = 0.01\mu F$$

i. Find the A,B, C, D parameters of the line,

ii. Calculate the sending end voltage, current, and power factor,

iii. Determine the voltage regulation and the efficiency of the line.

Question 3 [15]

A 280 kV, 3-phase transmission line has the following parameters:

$A = 0.94\angle 2^{o}$ $B = 116\angle 75^{o}\ \Omega$

If the receiving end voltage is 280 kV, determine :

(a) Sending end voltage if a load of 200 MW, 280 kV at 0.8 lagging power factor is being delivered at the receiving end,

(b) Repeat part (a) when supplying the same load (200 MW) at 0.8 lead power factor. What is your comment when you compare the results of (a) and (b).

(c) The maximum power that can be delivered if the sending end voltage is held at 295 kV while the receiving end voltage is 280 kV.

With my best wishes
Dr. Sahar Kaddah