Code No: R31023 **R10** **Set No: 2**

III B.Tech. I Semester Supplementary Examinations, June/July -2014

POWER SYSTEMS - II

(Electrical and Electronics Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

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1. (a) What are the factors which govern the inductance of a transmission line.
   (b) A 3-phase line with equilateral spacing of 3m is to be rebuilt with horizontal spacing $(D_{13} = D_{12} = D_{22})$. The conductors are to be fully transposed. Find the spacing between adjacent conductors such that the new line has the same inductance as the original line.

2. (a) Give the classification of transmission lines. Explain the influence of P.f on the performance of a transmission lines.
   (b) A 3-plase voltage of 11KV is applied to a line having $R = 10\Omega$ and $X_L = 12\Omega$ per conduction. At the end of the line is a balanced load of P KW at leading P.f. At what value of 'P' is the voltage regulation zero when the P.f of the loads (i) 0.707 and (ii) 0.85.

3. (a) Derive equations which represents the performance of long transmission line with its electrical parameters uniformly distributed along its length.
   (b) The line constants of a 3-phase long line are $A = 0.85\angle 2.3^{o}$, $B = 180\angle 75^{o}$ and $C = 0.0014\angle 90^{o}$. Determine the sending end quantities when the open circuit voltage at the receiving end of the line is 220KV.

4. An overhead line with inductance and capacitance per km of 1.2 mH and 0.9 µF is connected in series with an underground cable having inductance and capacitance of 0.16 mH/km and 0.28 µF/km. Calculate the values of transmitted and reflected waves of voltages and currents at the junction due to a voltage surge of 110KV travelling to the junction. Along the line towards the cable.

5. (a) Explain the effect of charging current on the performance of transmission line.
   (b) A 220 KV, 50Hz transmission line consists of 30 mm diameters conductor spaced 2.5m apart in the form of an equilateral triangle. In the temperature is 38°C and atmospheric pressure is 76 cm, Calculate the corona loss per km of the line. Assume the irregularity factor as 0.83.

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6. (a) Why it is necessary to provide sag while stringing the transmission line conductors.
   (b) A transmission line conductor crossing a river is supported form two towers of heights of 30m and 80m above the water level. The horizontal distance between the towers is 450m. If the tension of the conductors is 1500Kg and weight of the conductor is 1.4 Kg/m length. Find the minimum clearance of the conductor and water and clearance mid way between the supports.

7. (a) Explain how the string efficiency can be improved in practice.
   (b) An insulator string has three units each having a safe working voltage of 15KV. The ratio of unit self capacitance to stray capacitance of earth is10:1. Calculate the maximum safe working voltage and the string efficiency.

8. (a) Explain the booster transformer with neat diagram? Where is it used.
   (b) A star connected 400 HP, 2000V, 50Hz motor works at a P.f the 0.75 lag. A bank of mesh connected capacitors is used to rise the P.f of 0.95 lag. Determine the capacitance of each unit and total number of units required, if each is rated 500V, 50Hz . The motor efficiencies is 85%.

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Code No: R31023 **R10** **Set No: 3**

III B.Tech. I Semester Supplementary Examinations, June/July -2014

POWER SYSTEMS - II

(Electrical and Electronics Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

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1. (a) Distinguish between AC and DC resistance of conductors. Why the two differ. Explain fully.
   (b) An overhead line 50km in length is to be constructed of conductors 2.56 cm in diameter, for single phase transmission. The line reactance must not exceed 31.4 ohms. Find the maximum permissible spacing.

2. (a) Define regulation, efficiencies, losses and P.f at each end of the line and explain. how these characteristic are affected by the constants of the lines.
   (b) A 40MVA generating station is connected to a three phase line having $Z = 300 \angle 75^{o}\,\Omega$, $Y = 0.0025 \angle 90^{o}\, mho$
   The power at the generating station is 40MVA at units P.f at a voltages of 120KV. There is a load of 10MW at UPF at the midpoint of the line. Calculate the voltage and load at the distant end of the line use nominal –T circuit for the line.

3. Explain the physical significance of the generalized ABCD constants of a transmission line. State the units of these constants. Determine these constants for a long transmission line.

4. (a) Define surge impedance of a line. Obtain the expressions for voltage and current waves at a junctions or at a transitions point.
   (b) An inductance of 700μH connects two sections of a transmission line each having a surge impedance of $350\,\Omega$, A 400KV, 1μ sec rectangular surge travels along the line towards the inductance. Find the maximum value of the transmitted wave.

5. (a) Explain the effect of skin and proximities effects on the performance of AC transmission line.
   (b) A 3-Phase,220KV,50Hz transmission line consists of 15mm a radius conductor spaced 2m apart in the form of an equilateral triangle. If the temperature is 40^{o}C and atmospheric pressure is 76cm. Calculates the corona loss per km of the line. Assume irregular factor is 0.85.

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6. (a) Discuss the importance of stringing chart and mention its applications.
   (b) An overhead has the following data:
   Span length = 200m, cross sectional area of the conductor =2.9 cm^2, vertical sag =2.28 cm, wind force =1.4 Kg/m run, breaking stress = 2480 Kg/cm^2, weight of the conductor = 1.12 Kg/m run, calculate the safety factor.

7. (a) What do for understand by grading of insulators? Explain.
   (b) Each conductor of a 3-Phase over head transmission line suspended form a cross arm of a steel tower by a string of four suspension insulators. The voltage across the second unit is 15KV and across the third 20 KV. Find the voltage between conductors and string efficiency.

8. (a) What are the specifications of load compensation?
   (b) A 3-phase transmission line has resistance and reactance per phase of 10Ω and 15Ω respectively. The supply voltage is 132 KV while the load end voltage is maintained 125 KV for all loads by an automatically controlled synchronous phase modifier. If the KVAr rating of a modifies has a same value for zero loads as for a load of 40MW, find the rating of phase modifies.

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POWER SYSTEMS - II

(Electrical and Electronics Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

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1. (a) Name and explain briefly the four parameters on which the performance of a transmission line as an element of power systems depends?
   (b) Calculate the 50Hz inductive reactance at 1m spacing in ohms/km of a cable consisting of 12 equal stands around a non conducting core. The diameter of each strand is 0.25cm and the outer diameter of the cable is 1.25 cm.

2. (a) How are transmission lines classified.
   (b) Using the nominal Π method. Find the sending end voltage and voltage regulation of a 250 km 3-phase,50Hz transmission line delivering 25MVA at 0.8 lag P.f to a balanced load at 132 KV. The line conductors are spaced equilaterally 3m apart. The conductor resistance is 0.11 ohm/km and its effective diameter is 1.6 cm. neglect leakage.

3. Starting form first principle derive an expression for the sending end voltage and current of a long transmission line in terms of the line parameters and receiving end voltage and current.

4. An overhead line is connected to terminal apparatus through a length of single phase cable, the characteristic impedance being 500 and 25Ω A travelling wave of vertical front and infinites tail of 230 KV magnitude originates in the line and travels towards the junction with the cable. Calculate the energy transmitted into the cable during a period 5 μ sec after the arrival of the wave at the junction, what voltage is reflected back into the line.

5. (a) Explain the effect of Ferranti effect on the performance of transmission lines with neat phasor diagram.
   (b) Find the disruptive critical and visual corona voltage of a grid line operating at 132 KV. The following data is given:
   Conductor diameter = 1.9cm, conductor spacing = 3.81 cm
   Temperature = 44^{o}C, barometric pressure = 73.7cm
   Conductor surface factor: Fine weather = 0.8, rough weather = 0.66.

6. (a) What is the effect of wind and ice on sag? Explain with diagram.
   (b) An overhead line has a span of 180m. The conductor has cross sectional area of 1.22 cm^2 and weight 1.12 Kg/m and has a breaking stress of 4150Kg/cm^2. Allowing a wind pressure of 110 Kg/cm^2, Calculate the sag of a factor of safety of 4.

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7. (a) What are the reasons of insulation failure? Why arcing horn is provided across the insulators.
   (b) For a string insulator with four discs, the capacitance of the disc is 12 times the capacitance between the pin and earth. Calculates the voltage across each disc when used on132KV. Also calculate the string efficiencies.

8. (a) Explain the objectives of load compensation.
   (b) A 3-phase transmission line have an impedance of $(3 + j\,8)\Omega$ supplies a load of 2.5 MW at 0.8 P.f lag. The receiving and voltage is maintained at 11KV by means of static condenser drawing 2MVAr form the line. Calculate the sending end voltage and P.f. What is the regulation and efficiency of feeder.

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