Code No: R31023 **R10** **Set No: 1**

III B.Tech. I Semester Supplementary Examinations, May 2013

POWER SYSTEMS - II

(Electrical and Electronics Engineering)

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

Answer any FIVE Questions

All Questions carry equal marks

*****

1. (a) Derive the equation for inductance of a single phase two wire line.
   (b) Calculate the capacitance of a conductor to neutral in a single-phase transmission line having two parallel conductors spaced 3 m apart. The diameter of each conductor is 1 cm.

2. (a) Derive the ABCD parameters for nominal T circuit of a medium transmission line.
   (b) A single-phase, 11 kV line with a length of 15 km is to transmit 500 kVA. The inductive reactance of the line is 0.6 per km and the resistance is 0.25 per km. Calculate the efficiency and regulation for a p.f of 0.75 lead.
3. (a) Derive equivalent ABCD parameters of two transmission lines when they are connected in parallel.
   (b) The generalized ABCD constants of a three phase power transmission line are as follows: A=D=(0.936+j0.016), B=(33.5+j138)ohm, C=(-5.18+j914)x10^{-6} mho. The load on the receiving end bus is 50 KW at 220 KV with a lagging power factor of 0.9. Find the magnitude of the sending end voltage and the voltage regulation. Assume that the magnitude of the sending end voltage remains constant.

4. (a) Derive the travelling wave equations in a lossless transmission line.
   (b) The ends of two long transmission lines, A and C are connected by a cable B, 1km long. The surge impedances of A, B, C are 400, 50 and 500 ohms respectively. A rectangular voltage wave of 25 kV magnitude and of infinite length is initiated in A and travels to C, determine the first and second voltages impressed on C.

5. (a) What is corona and what are the factors which affect corona loss? Discuss them briefly.
   (b) An overload transmission line operates at 210 kV between phases at 50 Hz. The conductors are arranged in a 3.5 m delta formation. What is the maximum diameter of conductor that can be used for no corona loss under fair weather conditions? Assume an air density factor of 0.9 and irregularity factor of 0.82. The critical voltage is 230 kV. Find also the power loss under storm conditions.

6. (a) Describe the effect of wind on conductor?
   (b) Explain the effect of ice on the conductor.
   (c) Explain about string chart and discuss its applications.

7. (a) Explain the use of grading rings and arcing horns on suspension insulators.
   (b) A string consisting of seven suspension discs is fitted with a grading ring. Each pin to earth capacitance is C. If the voltage distribution is uniform, determine the values of line to pin capacitance.

8. (a) Explain how the capacitors improves power factor in power system?
   (b) Classify different voltage regulation systems in power system and explain their functioning?

*****

|''|'||'|''|''|''''|

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

III B.Tech. I Semester Supplementary Examinations, May 2013

POWER SYSTEMS - II

(Electrical and Electronics Engineering)

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

Answer any FIVE Questions

All Questions carry equal marks

*****

1. (a) Derive the equation for capacitance of a single phase two wire line.
   (b) The three conductors of a three phase line are arranged in a horizontal plane and are 4 m apart. The diameter of each conductor is 2cm. Calculate the capacitance of conductor.

2. (a) Derive the expressions for the ABCD constants for the nominal-Π circuit of a medium transmission line.
   (b) The following data refers to a 50 Hz, three-phase transmission line: length 10 km; sending-end voltage =11 kV; load delivered at receiving end 100 kW at 0.8 p.f. lead; resistance of each conductor = 0.3 ohms/ km; reactance per phase = 0.45 ohms / km. Find
   i) Receiving-end voltage
   ii) Line current
   iii) Efficiency of the transmission line
   .

3. (a) Explain what is Ferranti effect?
   (b) Discuss what is surge impedance loading? Derive the equation for surge impedance.

4. What are called travelling waves? Discuss its behavior on transmission line with different terminations.

5. (a) Describe the radio interference due to corona in transmission lines..
   (b) Describe the factors affecting corona?

6. (a) Prove that the ice on the conductor increases the weight and sag of the conductor?
   (b) A transmission line conductor has an effective diameter of 19.5 mm and weighs 1.0 kg/m. If the maximum permissible sag with a horizontal wind pressure of 39 kg/m^2 of projected area and 12.7 mm radial ice coating is 6.3m. Calculate the permissible span between two supports at the same level allowing a safety factor of 2. Finally, strength of the conductors is 800kg and weight of ice is 910 kg/m^3.

7. An insulator string containing five units has equal voltage across each unit by using disc of different capacitances. If the top unit has a capacitance of C and pin to tower capacitance of all units is 20 percent of the mutual capacitance of top unit. Calculate mutual capacitance of each disc in a string.

8. (a) Describe the voltage control techniques in power system.
   (b) What is series compensation? Explain with an example.

*****

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

III B.Tech. I Semester Supplementary Examinations, May 2013

POWER SYSTEMS - II

(Electrical and Electronics Engineering)

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

Answer any FIVE Questions

All Questions carry equal marks

*****

1. (a) What is the effect of bundle conductors on line inductance and capacitance, Explain?
   (b) Derive the equation for the capacitance of a three phase symmetrically spaced line?

2. A balanced 3-phase load of 30MW is supplied at 132kV, 50Hz and 0.85 p.f. lagging by means of a transmission line. The series impedance of a single conductor is (20 + j52) ohms and the total phase-neutral admittance is 315×10^{-6} mho. Using nominal-T method, determine: (i) The A, B, C and D constants of the line, (ii) Sending end voltage, (iii) Regulation of the line.

3. (a)Explain the physical significance of the generalized constants A,B,C and D. A=D=0.936+j 0.016; B=33.5+j138 ohms; C=(-5.18+j914) 10^{-6}mhos. The load at the receiving end is 50 MW at 220 kV with a power factor of 0.9 lagging. Find the sending end voltage.
   (b) Define regulation of a short 3-phase transmission system and derive an expression for approximate voltage regulation equation of line.

4. (a) When the transmission line is terminated by the capacitive load, find out the expressions of reflected voltage and current wave.
   (b) An under ground cable having an inductance of 0.3mH per km and a capacitance of 0.4μF per km is connected in series with an overhead line having an inductance of 2.0mH per km and a capacitance of 0.014μF per km. Calculate values of reflected and transmitted wave of voltage and current at junction due to a voltage surge of 110kV travelling to a junction along the cable.

5. (a) List and explain the factors affecting corona?
   (b) A 3-phase line has conductors 2.5 cm in diameter spaced equilaterally 3m part. If the dielectric strength of air is 21.21 kV (rms) per cm, find the disruptive critical voltage for the line. Take air density factor d=0.953 and irregularity factor m0 = 0.92.

6. An overhead line has a span of 160 m of copper conductor between level supports. The conductor diameter is 1.5 cm and has a breaking stress of 35 kg/mm. Calculate
   i) The deflecting sag.
   ii) The vertical sag. The line is subjected to a wind pressure of 40 kg/m^2 of projected area and radial ice coating of 9.53 mm thickness. The weight of ice is 913.5 kg/m^3. Allow a factor of safety of 2 and take the density of copper as 8.9 g/cm^3.

7. (a) Explain how the electrical breakdown can occur in an insulators?
   (b) Each conductor of a 33 kV, 3-phase system is suspended by a string of 3 similar insulators. The capacitance between each insulator pin and earth is 13% of self capacitance of each insulator. Find (i) distribution of voltage across three insulators (ii) String efficiency.

8. What are the different line compensation techniques are there? Describe each one of them in detail?

*****

Code No: R31023 **R10** **Set No: 4**

III B.Tech. I Semester Supplementary Examinations, May 2013

POWER SYSTEMS - II

(Electrical and Electronics Engineering)

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

Answer any FIVE Questions

All Questions carry equal marks

*****

1. (a) Derive an expression for the inductance per phase of a 3-phase overhead transmission line if conductors are asymmetrically placed but lines are un transposed.
   (b) Calculate the inductance and reactance of each phase of a three-phase 50Hz, overhead high-tension line (HTL) which has conductors of 2.5cm diameter. The distances between the three-phases are (i) 5m between A and B. (ii) 3m between C and A.
   Assume that the phase conductors are transposed regularly.

2. A balanced 3-phase load of 35 MW is supplied at 110 kV, 50Hz and 0.8 p.f lag by means of a transmission line. The series impedance of a single conductor is (15+j35) ohms and the total phase-neutral admittance is 300×10^{-6} mhos. Use nominal - T method to determine
   (i) A, B, C, D constants of the line, (ii) Vs (iii) Regulation of the line and (iv) Efficiency.

3. (a) Derive the equivalent ABCD constants of a transmission line connected in series with an impedances at both ends.
   (b) The per-unit-length parameters of a 215kV, 400km, 60Hz, three phase long transmission line are $y = j3.2 \times 10^{-6}$ mhos per km per phase and $z = (0.1 + j\ 0.5)$ ohm/km. The line supplies a 150 MW load at unity power factor. Determine
   (i) The voltage regulation (ii) The sending-end power and (iii) The efficiency of transmission.

4. (a) What is the outcome of the transient in the transmission lines? Develop the differential equation for the transient in the transmission system.
   (b) A 500 kV, 2 μsec, duration rectangular surge passes through a line having surge impedance of 350 and approaches a station at which the concentrated earth capacitance is 3×10^{3} pF. Calculate the maximum value of surge transmitted to the second line.

5. (a) Explain what is corona and specify its advantages and disadvantages.
   (b) Describe what radio interference is.

6. (a) Explain the factors affecting the mechanical design of the line.
   (b) An over head line with stranded copper conductor is supported on two poles 200 meters apart having a difference in level of 10 m the conductor diameter is 2 cm and weighs 2.30 kg/m square meter of the projected area and the factor of safety is 4. The maximum tensile strength of the copper is 4220 kg/square meter.

7. (a) Explain why suspension type of insulators are preferred for high voltage overhead lines. Sketch a sectional view of one unit of the suspension type insulator and describe the construction.
   (b) An insulator string containing five units has equal voltage across each unit by using disc of different capacitances. If the top unit has a capacitance of C and pin to tower capacitance of all units is 20 percent of the mutual capacitance of top unit. Calculate mutual capacitance of each disc in a string.
8. Describe the different compensation techniques in transmission system.

*****