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

III B.Tech I Semester Supplementary Examinations, May/June - 2015

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) Explain the effect of ground on the capacitance value and further derive the capacitance of a single phase transmission line. [8]

b) Two conductors of a single phase line, each of 1 cm diameter, are arranged in a vertical plane with one conductor mounted 1m above the other. A second identical line is mounted at the same height as the first and spaced horizontally 0.25 m apart from it. The two upper and the two lower conductors are connected in parallel. Determine the inductance per km of the resulting double circuit line. [7]

2 a) Draw the phasor diagram of a short transmission line and derive an expression for voltage regulation. [8]

b) A 3-phase 50 Hz transmission line has resistance, inductance and capacitance per phase of 10 Ω, 0.1 H, and 0.9 μF and delivers a load of 35MW at 132 kV and 0.8 pf lag. Determine the efficiency and regulation of the line using nominal-T method. [7]

3 a) With reference to long transmission lines, give physical interpretation of the terms 'characteristic impedance' and 'propagation constant'. What is meant by surge impedance? [8]

b) Derive the expression for the regulation of a short transmission line. [7]

4 a) Discuss the phenomenon of wave reflection and refraction. [8]

b) A surge of 10 kV travels along the cable towards its junction with an overhead line. The surge impedances of the cable and the line are 50 Ω and 450 Ω respectively. Determine the surge voltage transmitted into the overhead line. [7]

5 a) Explain the phenomenon of corona. What are the factors affecting corona? [8]

b) Explain difference between skin effect and proximity effect. [7]

6 a) State significance of stringing chart and sag template. [8]

b) A transmission line has a span of 214 metres between level supports. The conductors have a cross-sectional area of 3.225 cm^2. Calculate the factor of safety under the following conditions: vertical sag = 2.35 m; wind pressure = 1.5 kg/m run; breaking stress = 2540 kg/ cm^2; weight of conductor = 1.125kg/m run. [7]

7 a) Explain different type of insulators used in power systems. [8]

b) A string insulator has five units each rated for 11kV. Find the maximum line voltage on which it can be operated safety. The mutual capacitance of unit is 10 times the capacitance between pin to earth. [7]

8 a) What are the different methods of voltage control in a power system? [8]

b) Explain the working principle of on-load tap changing transformer with a neat diagram. [7]

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

III B.Tech I Semester Supplementary Examinations, May/June - 2015

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 bundled conductors? Discuss the merits and demerits of bundled conductors. [8]

b) A conductor consists of seven identical strands each having a radius of *r*. Determine the factor by which *r* should be multiplied to find the self GMD of the conductor. [7]

2 a) Draw and explain the equivalent circuits and phasor diagrams for the nominal T and π methods in detail. [8]

b) Estimate the distance over which a load of 15000kW at a p.f. 0.8 lagging can be delivered by a 3-phase transmission line having conductors each of resistance 1 Ω per kilometre. The voltage at the receiving end is to be 132 kV and the loss in the transmission is to be 5%. [7]

3 a) Explain the terms "characteristic impedance" and "propagation constant" with respect to long transmission lines. [8]

b) Explain the equivalent –π representation of a long transmission line. [7]

4 a) What is meant by natural loading of lines? Explain with reasons whether the economic loading for over head lines are more/less than their natural loadings. [8]

b) Explain the concept of reflection and refraction of travelling waves. [7]

5 a) What is corona? Show that the maximum critical disruptive voltage occurs when the radius of conductor is *d/e* where *d* is the distance between conductors. [8]

b) Define skin effect and proximity effect. [7]

6 a) Derive an expression for sag and tension in a power conductor strung between two supports at equal heights taking into account the wind and ice loading also. [8]

b) An overhead line is has a span of 150 m between level supports. The conductor diameter is 0.85 cm and weighs 0.62kg/m length. The allowable tension is 586kg. Calculate the sag if the wind pressure is 39.2 kg/m^2 of a projected area. [7]

7 a) Define string efficiency? Why is it necessary to have high string efficiency? How can it be achieved? [8]

b) A string of four insulators has a self-capacitance equal to 5 times pin to earth capacitance. Find i) the voltage distribution across various units as a percentage of total voltage across the string and ii) string efficiency. [7]

8 a) Discuss the importance of voltage control in the modern power system? [8]

b) What is the importance of power factor in the supply systems? [7]

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

III B.Tech I Semester Supplementary Examinations, May/June - 2015

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) Derive the expression for the inductance of a 3- phase line which is completely transposed. [8]

b) A single circuit 3- phase line operating at 50 Hz has a conductor diameter of 5.18 mm. The spacing between the line conductors is given in metre. D_{ry} = 3.2; D_{yb} = 4.0; D_{br} = 5.0. Calculate the inductance and inductive reactance per phase per km. [7]

2 a) Obtain A, B, C, D constants for a short transmission line. [8]

b) A 3-phase transmission line delivers a load of 5 MW at 0.8 pf (lagging). Resistance of each conductor is 0.7 Ω /km. Receiving end voltage is 33kV. If the line loss is not to exceed 10%, determine the length of the line. [7]

3 a) Derive an expression for travelling waves in overhead line and its interpretation from physical significance point of view. [8]

b) Explain in detail about the equivalent T-representation of a long transmission line. [7]

4 a) Discuss the behavior of a travelling wave when it reaches a) short circuited b) open circuited transmission lines. [8]

b) Discuss the methodology for analyzing the behavior of travelling waves in power system. [7]

5 a) Explain the factors that affect the corona loss on an over head transmission line. [8]

b) Find the disruptive critical and visual corona voltages of a grid line operating at 132 kV. The following data is given: Conductor diameter = 1.9 cm, conductor spacing = 3.81 cm, temperature = 55^{o} C, barometric pressure = 73.7 cm, conductor surface factor: fine weather = 0.8, rough weather = 0.66. [7]

6 a) What is stringing chart? What is its utility? [8]

b) An overhead line has a span of 260 m, the weight of the line conductor is 0.68kg per metre run. Calculate the maximum sag in the line. The maximum allowable tension in the line is 1550 kg. [7]

7 a) Define ‘string efficiency’. Explain different methods of improving string efficiency. [8]

b) A string insulator has three units. The capacitance from each joint is 12.5% of the capacitance of each unit. The voltage across any unit should not exceed 11kV. Find the maximum voltage for the string application. [7]

8 a) Explain the different methods used for voltage control of a power system? [8]

b) Discuss the need for line compensation in power system. [7]

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

III B.Tech I Semester Supplementary Examinations, May/June - 2015

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) Derive the expression for capacitance of a 3- phase overhead line with unsymmetrical spacing. [8]

b) Find out the capacitance of a single-phase line 30 km long consisting of two parallel wires each 15 mm diameter and 1.5 m apart. [7]

2 a) Derive A, B, C, D constants of a medium length transmission line and hence prove that AD – BC = 1. [8]

b) Find the A, B, C, D parameters of a 3- phase , 80 km, 50 Hz transmission line with series impedance of (0.15+j 0.78) ohm per km and a shunt admittance of $j5.0\times10^{-6}$ ohm per km. [7]

3 a) Using rigorous method derive expressions for sending-end voltage and current for long transmission line. [8]

b) Find the A,B,C,D parameters of a 3-phase, 80km, 50Hz transmission line with series impedance of (0.15+J0.78) ohm per km and a shunt admittance of $J5\times10^{-6}$ mho per km. [7]

4 a) Explain the significance of surge impedance loading of transmission line. [8]

b) Obtain the expressions of reflection and transmission coefficients at the receiving end of line characteristics impedance Z_{c1} for the case where line is terminated by short circuit. [7]

5 a) What is corona? Explain briefly the factors which affect corona. [8]

b) Taking the dielectric strength of air to be 30kV/cm, calculate the disruptive critical voltage for a 3- phase line with conductors of 1 cm radius and spaced symmetrically 4 m apart. [7]

6 a) Discuss the effect of wind and ice on sag calculations. [8]

b) A transmission line has a span of 150 m between level supports. The cross sectional area of the conductor is $1.25cm^2$ and weighs 100kg/100 m. The breaking stress is $4,220kg/cm^2$, calculate the factor of safety if the sag of the line is 3.5 m. Assume a maximum wind pressure of $100\ kg/m^2$. [7]

7 a) Name the different types of insulators used in power systems along with uses of each insulator and explain pin type insulator in detail. [8]

b) Define string efficiency. Calculate its value for a string of 3 insulator units used if the tail capacitance of each unit to earth and line be 20% and 5% of the self capacitance of the unit. [7]

8 a) Discuss the various methods for power factor improvement. [8]

b) What is the effect of low power factor on the generating stations? [7]

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