Code No: RT31023 **R13** SET - 1

III B. Tech I Semester Regular Examinations, November - 2015

POWER SYSTEMS-II

(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answering the question in **Part-A** is compulsory
3. Answer any **THREE** Questions from **Part-B**

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PART –A

1 a) Give the advantages of bundled conductors. [3M]

b) Define voltage regulation and efficiency of transmission lines. [3M]

c) What do you mean by surge impedance and surge impedance loading of transmission line? [4M]

d) What is reflection & refraction coefficient of current and voltage wave of transmission line when receiving end is open circuited. [4M]

e) What is skin effect? On what factors does it depend? [4M]

f) Define String efficiency of suspension insulator string. List the methods to improve it? [4M]

PART –B

2 a) Derive the expression for inductance of a three phase double circuit line. [8M]

b) Three conductors of three phase line are arranged at corners of triangle of sides 2m, 3.2m and 4m. The diameter of the conductor is 2.5cm. Calculate the inductance and capacitance of a three phase three wire system. [8M]

3 a) Show how regulation and transmission efficiency are determined for medium lines using end condenser method and illustrate your answer with suitable vector diagram. [6M]

b) A three phase transmission line is 135 km long. The series impedance is Z=0.04 + j 0.95 ohm per phase per km, and shunt admittance is Y=j 5.1×10^{-6} mho per phase per km. The sending end voltage is 132 kV and the sending end current is 154 A at 0.9 power factor lagging. Determine the voltage, current and power at the receiving end and the voltage regulation using medium line-T model. [10M]

4 a) Derive expressions for ABCD constants for lossless long transmission line. Assume distributed parameters for the line. [8M]

b) A three - phase overhead transmission line has series impedance per phase of $250\angle80^0$ ohms and a total shunt admittance of $0.0019\angle90^0$ siemen per phase. The line delivers a load of 100MW at 0.8 p.f lagging and 200kV between the lines. Calculate the sending-end voltage and current by the rigorous method. [8M]

5 a) Derive the travelling wave equations in a lossless transmission line. [6M]

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. [10M]

6 a) Explain in brief about shunt compensation in power systems. [8M]

b) Explain the principle of operation and working of synchronous capacitors in power system for improvement of power factor. [8M]

7 a) What is sag template? Explain the construction of pin type insulator. [8M]

b) Derive the expression for string efficiency of a string of 3- insulators. [8M]

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Code No: RT31023 **R13** SET - 2

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POWER SYSTEMS-II

(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

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2. Answering the question in **Part-A** is compulsory
3. Answer any **THREE** Questions from **Part-B**

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PART –A

1	a)	Give the list of various types of conductors.	[3M]
	b)	What are the differences between nominal-T and nominal-π methods?	[3M]
	c)	What are ABCD constants of long transmission line?	[4M]
	d)	What are types of power system transients?	[4M]
	e)	What are the factors affecting corona?	[4M]
	f)	What are stringing chart and sag template?	[4M]

PART –B

2	a)	What are bundled conductors? Discuss the advantages of bundled conductors, when used for overhead lines.	[6M]
	b)	A 3-phase, 50 Hz, 66 kV overhead transmission line has its conductors arranged at the corners of an equilateral triangle of 3m sides and the diameter of each conductor is 1.5 cm. Determine the inductance and capacitance per phase, if the length of line is 100 km. And also calculate the charging current.	[10M]
3	a)	Define A, B, C and D constants of a transmission line? What are their values in short lines?	[6M]
	b)	A 3-phase, 3km long line delivers 3000 kW at a power factor of 0.8 lagging to a load. If the voltage at the supply end is 11 kV, determine the voltage at the load end, percentage regulation, sending end power factor and the efficiency of transmission. The resistance and reactance per km of each conductor are 0.4 ohm and 0.3 ohm respectively.	[10M]
4	a)	Derive the expressions for voltage and current distribution over a long line. Explain the significance of characteristic impedance loading in connection with the long lines. Deduce the above voltage and current relations in the hyperbolic form and obtain the element values of an equivalent to represent the long lines.	[8M]
	b)	A 220 kV, 3-phase transmission line has impedance per phase of (60 + j 200) ohm and an admittance of (0 + j 0.0015) mho. Determine i) Sending end voltage and ii) Sending end current when receiving end current is 200 amps at 0.95 p.f lagging.	[8M]

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5 a) When the transmission line is terminated by the capacitive load, how do you find out the expressions of reflected voltage and current wave? [8M]

b) Step wave of 110 kV travels through a line having a surge impedance of 350Ω. The line is terminated by an inductance of 5000μH. Find the voltage across the inductance and reflected voltage wave. [8M]

6 a) What are skin and proximity effects on transmission lines? [6M]

b) Find the critical disruptive voltage and the critical voltages for local and general corona on a 3- phase overhead transmission line, consisting of 3-stranded copper conductors spaced 2.5 m apart at the corners of an equilateral triangle. Air temperature and pressure are 21^0C and 73.6 cm of Hg respectively. Take conductor diameter 10.4 mm, irregularity factor 0.85, local and general surface factors 0.7 and 0.8 respectively. [10M]

7 a) Explain the various methods used for improving string efficiency. [10M]

b) An overhead line has a span of 250 m. Find the weight of conductor if the ultimate strength is 5758kg, sag is 1.5 m and factor of safety is 2. [6M]

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Code No: RT31023 **R13** SET - 3

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POWER SYSTEMS-II
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Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answering the question in **Part-A** is compulsory
3. Answer any **THREE** Questions from **Part-B**

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PART –A

1	a)	Define GMD and GMR for transmission lines.	[3M]
	b)	Give the classification of overhead transmission lines.	[3M]
	c)	Define wave length & velocity of propagation of waves.	[4M]
	d)	What are the factors that cause a travelling wave?	[4M]
	e)	What is meant by Ferranti effect?	[4M]
	f)	Write down the expression for sag when supports are at equal and unequal levels.	[4M]

PART –B

2	a)	Briefly discuss the various types of conductor material used for over head transmission lines.	[8M]
	b)	What is the method of images? How can it be used to take into account the presence ground in calculating the capacitance of a single phase line?	[8M]
3		Find the ABCD parameters of a 3-phase, 80km, 50Hz transmission line with series impedance of (0.15 + j 0.28) ohm per km and a shunt admittance of $j5x10^{-4}$ mho per km for the both Π and T networks.	[16M]
4	a)	Explain characteristic impedance and surge impedance loading of long lines.	[6M]
	b)	A three-phase, 50 Hz, 150 km long transmission line has three conductors each of 0.7 cm radius spaced at the corners of triangle of sides 2 m, 3.5m and 4.5m. The resistance of each conductor is 0.4 ohms per km and the line delivers 50 MVA at 132 kV and at a lagging p.f. of 0.85. Determine ABCD constants as long line (both real and complex angle methods).	[10M]
5	a)	Explain the variation of current and voltage on an overhead line when one end of the line is short circuited and at the other end a source of constant voltage V is switched in.	[8M]
	b)	A 500 kV, 2 μsec, duration rectangular surge passes through a line having surge impedance of 350 Ω 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.	[8M]

6 a) Explain the phenomenon of corona. How can the corona loss be minimized in transmission lines? [8M]

b) A certain 3-phase equilaterally spaced transmission line has a total corona loss of 55 kW at 110 kV and a loss of 110 kW at 120 kV. What is the disruptive critical voltage between lines? What is the corona loss at 125 kV? [8M]

7 An overhead line has the following data: span length 185m, difference in levels of supports 5m, conductor diameter 1.82cm, weight per unit length of conductor 2.5kg/m, wind pressure 49kg/m^2 of projected area. Maximum tensile stress of the conductor 4250kg/cm^2. Factor of safety 5. Calculate the allowable sag in meters at the lower support. [16M]

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Code No: RT31023 **R13** SET - 4

III B. Tech I Semester Regular Examinations, November - 2015

POWER SYSTEMS-II

(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

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2. Answering the question in **Part-A** is compulsory
3. Answer any **THREE** Questions from **Part-B**

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PART –A

1	a)	What is the effect of ground on capacitance?	[3M]
	b)	What are ABCD constants for short transmission lines?	[3M]
	c)	What do you mean by incident, reflected and reflected waves?	[4M]
	d)	What are reflection and refraction coefficients of current and voltage wave of transmission line when receiving end is short circuited?	[4M]
	e)	What are the advantages of corona?	[4M]
	f)	Write down the expression for working stress and vertical sag.	[4M]

PART –B

2	a)	Derive the expression of capacitance for 2 wire and 3 wire systems.	[8M]
	b)	Calculate the capacitance of a conductor per phase of a three-phase 400 km long line, with the conductors spaced at the corners of an equilateral triangle of side 4 m and the diameter of each conductor being 2.5cm.	[8M]
3	a)	Explain the effect of power factor on regulation and efficiency.	[8M]
	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 Ω per km and the resistance is 0.25Ω per km. Calculate the efficiency and regulation for a p.f of 0.75 lag.	[8M]
4	a)	With reference to long transmission line, give physical interpretation of the terms of characteristic impedance and propagation constant? What is meant by surge impedance?	[8M]
	b)	Determine ABCD constant for 3-phase, 50 Hz transmission line 200 km long having the following distributed parameters. L= 1.20×10^{-3} H/km, C= 8×10^{-9} F/km, R = 0.15 Ω/km, G=0.	[8M]

5 a) When the transmission line is terminated through a resistance, how do you find out the expressions of reflection and refraction coefficient? [8M]

b) An overhead transmission line with surge impedance 400 ohms is 300 km long. One end of this line is short circuited and at the other end a source of 11 KV is suddenly switched in. Calculate the current at the source end 0.005 sec after the voltage is applied. [8M]

6 a) What is corona? Explain the theory of corona formation in detail. [6M]

b) What is Ferranti effect? Prove with mathematical expression the actual phenomenon that occurs in Ferranti effect. [6M]

c) What is skin effect? [4M]

7 a) What is guard ring which is being used in the suspension string type insulator? Deduce the relation for determining the capacitance formed by the ring. [8M]

b) A three phase over head line is being supported by three discs suspension insulators, the potential across the first and second insulators are 12 and 18 kV respectively. Calculate (i) the line voltage, (ii) the ratio of capacitance between pin and earth to self-capacitance of each unit, (iii) the string efficiency. [8M]

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