Code No: R1631021 **R16** SET - 1

III B. Tech I Semester Regular Examinations, October/November - 2018

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. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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PART –A

1. a) What is the need of double circuit transmission line? [3M]
   b) What is the effect of line capacitance for lagging load? [2M]
   c) Why rigorous solution method is required for long lines. [2M]
   d) What is meant by Wave front? [2M]
   e) What is meant by Ferranti effect? [3M]
   f) What are the main components of overhead lines? [2M]

PART -B

2. a) What are ACSR conductors? Explain the advantages of ACSR conductors when used for overhead lines. [7M]
   b) Calculate the capacitance per phase of a three phase, three wire system by considering earth effect, when the conductors are arranged in a horizontal plane with spacing $D_{12}=D_{23}=3.5$m, and $D_{31}=7$m. The conductors are transposed and each has a diameter of 2.0 cm. Assume the transmission line is 4m above the ground level. [7M]

3. a) What are various parameters of a transmission line and how they are considered for different lines? [7M]
   b) A three-phase line delivers 3600 kW at a power factor 0.8 lagging to a load. If the sending end voltage is 33 kV, determine i) receiving end voltage ii) line current iii) transmission efficiency. The resistance and reactance of each conductor is 5.31Ω and 5.54Ω respectively. [7M]

4. a) Starting from first principles deduce expressions for ABCD constants of a long line in terms of its parameters. [7M]
   b) A 3-phase transmission line has the following constants. Resistance/ ph/ km = 0.16 ohm; reactance/ ph/km = 0.25 ohm. Shunt admittance/ph/km = 1.5×10^{-6} mho. Calculate by rigorous method the sending end voltage and current when the line is delivering a load P-20MW at 0.8 p.f lagging. The receiving end voltage is kept constant at 110 kV. [7M]

5. a) Develop equivalent circuit for analyzing the behavior of traveling waves at transition point's transmission lines. [7M]
   b) Two stations are connected together by an underground cable having a surge impedance of 60 ohms joined to an overhead line with a surge impedance of 400 ohms. If a surge having a maximum valve of 100 kV travels along the cable towards the junction with the overhead line, determine the value of the reflected and transmitted wave of voltage and current at the junction. [7M]

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6. a) Explain the effect of radio interference on the performance of transmission lines. [7M]

   b) Find the disruptive critical voltage and visual corona voltage (local corona as well as general corona) for a 3 phase 220 kV line consisting of 22.26 mm diameter conductors spaced in a 6 meters delta configuration. The following data can be considered. Temperature 25^0 C, Pressure 73 cm of mercury, surface factor 0.84, irregularity factor for local corona 0.72, irregularity factor for general corona 0.82 m. [7M]

7. a) Explain why suspension insulators are preferred for high voltage transmission lines. What is a strain insulator and where it is used? [7M]

   b) An overhead line has the following data: span length 160 meters, conductor diameter 0.95 cm, weight per unit length of the conductor 0.65 kg/meter. Ultimate stress 4,250 kg/cm^2, wind pressure 40 kg/cm^2 of projected area. Factor of safety 5. Calculate sag? [7M]

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Code No: R1631021 **R16** SET - 2

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(Electrical and Electronics Engineering)

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2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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PART –A

1.	a)	What are the advantages of bundled conductor?	[2M]
	b)	What are the limitations of nominal T and π methods?	[2M]
	c)	What are the methods used for computing the hyperbolic functions in the solution of long lines.	[2M]
	d)	What are the causes of traveling wave in the transmission lines?	[2M]
	e)	Define the skin and proximity effects.	[3M]
	f)	What are the disadvantages of loose span?	[3M]

PART -B

2.	a)	Clearly explain what do you understand by GMR and GMD of a transmission line?	[7M]
	b)	Calculate the capacitance per phase of a three phase, three wire system, when the conductors are arranged in a horizontal plane with spacing $D_{12}=D_{23}=3.5$m, and $D_{13}=7$m. The conductors are transposed and each has a diameter of 2.0 cm.	[7M]
3.	a)	Explain the effect of power factor on regulation and efficiency.	[6M]
	b)	A 3- phase has a series impedance of $300\angle 75^0$ ohms per phase and shunt admittance of $25\times 10^{-4}\angle 90^0$ siemens per phase. The voltage at the receiving end is 220kV but there is no load at receiving end. A load of 100 MW at UPF is connected at the midpoint of the line. Using nominal-π method, find sending end voltage.	[8M]
4.	a)	Explain the surge impedance loading with necessary expressions.	[7M]
	b)	A 3- phase transmission line is 480km long and serves a load of 400MVA, 0.8p.f lag at 345kV. The ABCD constants of the line are $A=D=0.818\angle 1.3^0$; $B=172.2\angle 84.2^0$; $C=0.001933\angle 90.4^0$ mhos. Determine the sending end line to neutral voltage, the sending end current and the percent voltage drop at full load.	[7M]
5.	a)	Discuss the phenomenon of wave reflection and refraction. Derive expression for reflection and refraction coefficients.	[7M]
	b)	A 200 kV, 3 μs, rectangular surge travels on a line of surge impedance of 400 ohms. The line is terminated in a capacitance of 3000 pF. Find an expression for voltage across the capacitance.	[7M]

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6. a) Explain the effect of shunt compensation on the performance of transmission lines. [7M]

   b) A 132 kV line with 2 cm diameter is built so that corona takes place if the line voltage is 220 kV (r.m.s). If the value of potential gradient at which ionization occurs can be taken as 30 kV per cm (peak). Find the spacing between the conductors. [7M]

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

   b) A transmission line conductor having a diameter of 19.5 mm weighs 0.85 kg/m. The span is 275 meters. The wind pressure is 40 kg/m^2 of projected area with ice coating 13 mm. The ultimate strength of the conductor is 8000 kg. Calculate the maximum sag, if the factor of safety is 2 and ice weighs 910 kg/m^3? [7M]

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Code No: R1631021 **R16** SET - 3

III B. Tech I Semester Regular Examinations, October/November - 2018

POWER SYSTEMS–II

(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

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2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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PART –A

1. a) What are the properties of conducting material? [2M]
   b) How do you classify the transmission line in to short, medium and long lines. [3M]
   c) Define the surge impedance loading. [2M]
   d) What is a traveling wave? [2M]
   e) What is the effect on resistance of solid conductors? [3M]
   f) What are the needs of grading of insulators? [2M]

PART -B

2. a) What do you understand by transposition of lines? What is its effect on the performance of the line? [7M]
   b) Calculate the capacitance per phase of a three phase three wire transposed system when the conductors are arranged at the corners of a triangle having sides of 1.0 m, 1.5 m and 2.0 m. Diameter of each conductor is 1.2 cm. [7M]

3. a) Draw the vector diagrams of nominal-π and nominal T models of medium transmission line. Derive the expression for voltage regulation of both the models. [7M]
   b) An overhead single phase delivers 1.1MW at 33 kV at 0.9 power factor lagging .The total resistance of the line is 10Ω and the total inductive reactance is 15Ω. Determine (i) %voltage regulation (ii) sending end power factor (iii) transmission efficiency. [7M]

4. a) Explain the interpretation of the long line equations. [7M]
   b) 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 and regulation of line. [7M]

5. a) Define surge impedance of a line. Obtain the expressions for voltage and current waves at a junction or at transition point. [7M]
   b) A 200 kV surge travels on a transmission line 400 ohms surge impedance and reaches a junction where two branch lines of surge impedances of 500 ohms and 300 ohms are connected with the transmission line. Find the surge voltage and current transmitted into each branch line. Also find the reflected voltage and current. [7M]

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6. a) What is Ferranti effect? Deduce a simple expression for the voltage rise of an unloaded line. [7M]
   b) A 3-phase 220 kV, 50 Hz, transmission line consists of 3 cm diameter conductors spaced 2 meters apart in equilateral triangle formation .If the temperature is 20^0 C and atmospheric pressure 75 cm determine the corona loss per km of the line. Take irregularity factor as 0.8. [7M]

7. a) Explain how sag is determined for an overhead line conductor taking into account the effects of wind and ice loading. [7M]
   b) Each of the three insulators forming a string has a self-capacitance of 'C' Farads. The shunting capacitance of the connecting metal work of each insulator is 0.3 C to earth and 0.2 C to the line. A guard ring increases the capacitance to the line of the metal work of the lowest insulator to 0.5 C. Calculate the string efficiency of this arrangement with the guard ring. [7M]

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Code No: R1631021 **R16** SET - 4

III B. Tech I Semester Regular Examinations, October/November - 2018

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. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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PART –A

1. a) What is meant by loop inductance? [2M]
   b) Define distributed parameters in the transmission lines? [2M]
   c) Define the characteristic impedance and propagation constant of a transmission line. [2M]
   d) What are the expressions for the voltage and current when a line is terminated by an inductance and a capacitance? [3M]
   e) What are the disadvantages of corona? [3M]
   f) What is the need of arcing horns of insulators? [2M]

PART -B

2. a) Prove that the inductance of a group of parallel wires carrying current can be represented in terms of their geometric distance. [7M]
   b) Calculate the inductance of a conductor per phase of a three phase, three-wire system. When the conductors are arranged at the corners of an equilateral triangle of 3.5 m sides and the diameter of each conductor is 2 cm. [7M]

3. a) What do you understand by the terms nominal T and nominal-π circuits? Derive the expressions for the ABCD constants for the nominal-π circuit of a medium transmission line. [7M]
   b) An overhead 3- phase transmission line delivers 5000 kW at 22kV at 0.8 power factor lagging the resistance and reactance of each conductor is 4 ohms and 6 ohms respectively. Determine i) sending end voltage ii) percentage regulation and iii) Transmission efficiency. [7M]

4. a) Explain the equivalent π method of solution for the performance of long transmission lines? Draw a phasor diagram with the receiving end voltage as reference. [7M]
   b) Fine the network constants of a long transmission line 3 phase, 50 Hz and 150 km long whose resistance per km is 0.2 Ω and inductance per km is 1.5 mH and capacitance per km is 0.008 μF. Neglect the conductance of the line. [7M]

5. a) Starting from first principles show that surges behave as traveling waves find expressions for surge impedance and wave velocity. [7M]
   b) A 500 kV surge travels on an overhead line of surge impedance 400 Ω towards its junction with a cable which has a surge impedance of 40Ω. Find i) transmitted voltage and current, ii) reflected voltage and current. [7M]

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6. a) Discuss why receiving end voltage of an unloaded long line may be more than the sending end voltage. [7M]

   b) Find the disruptive critical voltage and visual corona voltage for a grid of line operating at 132 kV. The line consisting of 1.96 cm diameter conductors spaced 3.81 meters apart. The following data can be considered. Temperature 44^0 c, barometric Pressure 73.7 cm of mercury, conductor surface factor 0.84, fine weather 0.8, rough weather 0.66. [7M]

7. a) Derive the expression for sag and tension when the supports are at unequal heights. [7M]

   b) A string of eight suspension discs is fitted with a grading ring. Each pin to earth capacitance is C. If the voltage distribution is uniform find the values of line to pin capacitances. [7M]

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