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

III B. Tech I Semester Regular/Supplementary Examinations, October/November - 2019

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 (14 Marks)

1. a) Write the advantages of double circuit lines. [2M]
   b) Why the distributed parameters will result the accurate analysis than the lumped parameters? [2M]
   c) What is meant by attenuation constant and write its role in the transmission waves? [2M]
   d) Derive the expression for the raise in voltage due to Ferranti effect. [3M]
   e) What is meant by radio Interference? [3M]
   f) Write the properties of an insulator. [2M]

PART –B (56 Marks)

2. a) Explain the effect of earth on the capacitance of a transmission line by using the method of images. [7M]
   b) Three conductors of a three phase transmission line are arranged in a horizontal plane and are 4 meters apart. The diameter of each conductor is 2.4 cm. Find the inductance per kilometer of each conductor. Assume the load is balanced and the phase sequence as R, Y, B. Find the average inductance per phase for the regularly transposed line. [7M]

3. a) Explain the effect of power factor on the regulation of the short transmission line. [7M]
   b) A single phase overhead line is transmitting 1200 kW power to a factory at 11 kV and 0.75 power factor lagging. The total resistance and the loop reactance of the line are 3.1 ohm and 4.4 ohms respectively. Find the sending end voltage, sending end power factor, percentage of regulation and the transmission efficiency. [7M]

4. a) Derive the expression for the characteristic impedance of a long transmission line by rigorous method. [7M]
   b) Explain the concepts of incident, reflected and refracted waves in the transmission lines. [7M]

5. a) Prove that the velocity of propagation of travelling waves is equal to the velocity of light. [7M]
   b) Prove that the voltage and current waves are get attenuated when travelling over the line. [7M]
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6. a) Derive the expression for the power factor correction by using the shunt compensation. [7M]
   b) Discuss how the line voltage and the line spacing will effects the corona in the lines? [7M]

7. a) Derive the expression for the Sag in vertical plane when the conductor is covering ice and wind pressure. [7M]
   b) Each conductor of a three phase transmission line is suspended from a cross arm of a steel tower by a string of four suspension insulators. The voltage across the second unit is 15 kV and across the third is 20 kV. Find the voltage between the conductors and the string efficiency. [7M]

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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 **(14 Marks)**

1. a) Write the list of conductor configurations in the transmission system. [2M]
   b) Derive the expression for phase angle to get the zero regulation of short transmission line. [2M]
   c) What is meant by phase constant and write its role in the transmission waves? [2M]
   d) How the resistance of the conductor gets affected due to skin effect? [3M]
   e) Write the factors that the surge impedance will depend in the transmission system. [3M]
   f) Write the function of Guy type insulator in the power system. [2M]

PART –B **(56 Marks)**

2. a) A single phase transmission line has two parallel conductors, each of 1.6 cm diameter and 2.5 meters apart. Find the loop inductance per km length of the line if the material of the conductor is copper and the steel with relative permeability of 200. [7M]
   b) Calculate capacitance of a single phase transmission line 35 km long consisting of two parallel wires each 5 mm in diameter and 1.8 m apart. The height of the conductor above the ground is 7.8m. [7M]

3. a) Describe the effect of power factor on efficiency and regulation. [7M]
   b) A three phase overhead line delivers 4200 kW at a power factor of 0.8 lagging to a load. If the sending end voltage is 33 kV, and the resistance and reactance of each conductor are 4.4 ohms and 5.5 ohms respectively. Find the receiving end line voltage, line current and the transmission efficiency. [7M]

4. a) Derive the A, B, C, D constants of the long transmission lines by complex angle method. [7M]
   b) A 50 Hz , 400 kV transmission line is 450 km long and having the distributed parameters resistance is 0.032 ohms per km, L=1.057 mH/km, C=0.0109 micro farad per km. it is delivering 420 MW at 0.95 lagging. By neglecting the leakage conductance. Find the sending end voltage and current, power factor, load angle, A,B,C,D parameters, regulation and efficiency of the line. [7M]
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5. a) Explain in detail about the effects of power system transients. [7M]
   b) An overhead line with inductance and capacitance per km length of 1.2 mH and 0.09 micro farad respectively connected in series with an underground cable having inductance and capacitance of 0.4 mH per km respectively. Calculate the values of reflected and transmitted waves of voltages and current at the junction due to a voltage surge of 100 kV travelling to the junction along the line towards the cable and along the cable towards the line. [7M]

6. a) Discuss the effect of charging current in the Ferranti effect using the necessary expressions. [7M]
   b) Explain how the atmospheric conditions will affect the critical disruptive voltage? [7M]

7. a) Write the differences between porcelain and glass insulators. [7M]
   b) Discuss about the grading of insulators by deriving the necessary equations. [7M]

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

III B. Tech I Semester Regular/Supplementary Examinations, October/November - 2019

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(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 **(14 Marks)**

1. a) What are the advantages of the transposed conductor? [2M]
   b) Write the conditions in terms of length and operating voltage of short and medium transmission lines. [2M]
   c) What is meant by natural loading of long transmission line? [2M]
   d) Why is the velocity of propagation same for all overhead lines? [3M]
   e) Write about the parameters that the skin effect will depend. [3M]
   f) Write the differences between the string and the suspension insulators. [2M]

PART –B **(56 Marks)**

2. a) Analyze the capacitance of a double circuit three phase overhead line. [7M]
   b) Find the inductance per phase per km of a double three line. The radius of each conductor is 2.5 cm and the conductor is placed on the circumference of an imaginary circle of radius 7 m forming the hexagon. [7M]

3. a) Analyze the medium transmission line by assuming the capacitor is connected at the midpoint of the line. [7M]
   b) An overhead three phase transmission line delivers 4 MW at 11000 V at 0.8 power factor lagging. The resistance and reactance of earth conductor are 1.4 ohm and 4.1 ohms per phase respectively. Find the line sending end voltage, percentage regulation and the transmission efficiency. [7M]

4. a) Analyze the long transmission line with the series impedance connected at the receiving end. [7M]
   b) A three phase, 50 Hz, 500 km long transmission line has the following constants per phase per km uniformly distributed. R= 0.44 ohm; x= 0.9 ohms; $g=8*10e^{-9}$ mho and $b= 5.06*10e^{-6}$. Find the line constants by using the convergent series of complex angles and real angles. [7M]

5. a) Derive the expressions for the reflected and refracted waves in a line ended with infinite resistance. [7M]
   b) A surge of 110 kV is travelled by the line of surge impedance 550 ohms and reaches the junction of the line with two branch lines. The surge impedances of branch lines are 450 ohms and 50 ohms respectively. Find the transmitted voltage and currents. Also find the reflected voltage and current. [7M]
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6. a) Derive the expression for the maximum electric stress in the power conductors. [7M]
   b) A 3 phase, 220 kV, 50 Hz transmission line consists of 30 mm diameter conductor 2.5 m apart in the form of equilateral triangle. If the temperature is 38 degrees and atmospheric pressure 76 cm. Find the corona loss per km of the line and the irregularity factor is 0.83 and the stress is 21.21kV/cm. [7M]

7. a) Explain the role of guard ring in improving the string efficiency. [7M]
   b) Discuss the importance of stringing chart in the new line erection. [7M]

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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 (14 Marks)

1. a) List out various parameters of the transmission line. [2M]
   b) What are the differences between the lumped and the distributed parameters? [2M]
   c) Write about the incident and reflected voltage waves. [2M]
   d) Write about the components of voltages that will affect the power system during transients. [3M]
   e) How do you reduce the proximity effect in transmission lines? [3M]
   f) Write the disadvantages of the line having the loose span. [2M]

PART –B (56 Marks)

2. a) Discuss the concepts of self GMD and mutual GMD by deriving the equations of transmission lines. [7M]
   b) A 3 phase,132 kV, 50 Hz transmission line has steel cored aluminum conductors of equivalent copper area of 1.5 cm^2 and effective diameter of 39.2 mm spaced equilaterally 8 m apart. Find the constant per km length of the line. The resistivity of copper is 1.73 micro farad-cm. [7M]

3. a) Draw and explain the equivalent circuit of short transmission line by using the phasor diagram. [7M]
   b) A 3 phase, 50 Hz, 20 km long overhead line supplies 1100 kW at 11 kV, 0.8 power factor lagging. The line resistance and inductance are 0.05 ohms and 0.8 mH per phase per km. Find the line sending end voltage, percentage regulation, and transmission efficiency. [7M]

4. a) Evaluate the A, B, C, D constant of the long transmission line by using the hyperbolic charts. [7M]
   b) Explain in detail propagation constant and its importance in the long transmission lines. [7M]

5. a) Derive the expression for the velocity of travelling waves on a transmission line. [7M]
   b) Derive the expressions for the reflected and refracted waves in a line ended with zero resistance. [7M]
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6. a) Draw and explain the equivalent circuits with and without shunt capacitor compensation. Also draw the phasor diagrams. [7M]
   b) Discuss in detail about effect of the corona on the communication lines. [7M]

7. a) Derive the expression for the Sag in horizontal plane when the conductor is covering ice and wind pressure. [7M]
   b) In a five insulator disc string capacitance between each unit and earth is 1/5 of the mutual capacitance. Find the voltage distribution across each insulator in the string as percentage of voltage of the conductor to earth, find the string efficiency and how the efficiency is affected by rain? If the insulators in the string are designed each to with stand 35 kV maximum, find the operating voltage of the line where five insulators string can be used. [7M]

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