R13

Code No: 115AG

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, November/December - 2017
POWER SYSTEMS-II
(Electrical and Electronics Engineering)

Time: 3 hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A

(25 Marks)

1.a)	Define GMD.	[2]
b)	What are bundled conductors? Explain.	[3]
c)	How transmission lines are classified?	[2]
d)	Write A, B, C and D constants of a short transmission line.	[3]
e)	Distinguish between reflected and refracted waves?	[2]
f)	How skin effect influences the performance of transmission line.	[3]
g)	What is sag template?	[2]
h)	List the methods of improving string efficiency in insulators.	[3]
i)	State the limitations of solid cables.	[2]
j)	Write the expression for most economical conductor size in cables.	[3]

PART - B

(50 Marks)

2.a) What factors must be taken into account while calculating the resistance of overhead line conductors. How are these factors account for?

b) In a 3-phase transmission line the three conductors are placed at the corners of a triangle of sides 1.5m, 3m, and 2.6m respectively. If the diameter of each conductor is 1.4 cm and the conductors are regularly transposed, calculate the inductance/phase/km length of the line. [5+5]

OR

3.a) What is method of images? Derive an expression for the capacitance per unit length of a 3-phase transposed line. What is the effect of earth on the capacitance of the line?

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 capacitance per phase, if the length of line is 100 km. And also calculate the charging current. [6+4]

4.a) Explain the influence of power factor on the performance of a transmission line.

b) An overhead 1-phase transmission line delivers a load of 1.5kW at 33kV at 0.9 p.f. lagging. The total resistance and inductance of the overhead transmission line is 8 Ohm and 15 Ohm respectively. Determine the following:
i) Percentage of voltage regulation
ii) Sending end power factor.
iii) Transmission efficiency. [4+6]

OR

5.a) Derive the ABCD parameters of a nominal T represented medium length transmission line with neat phasor diagram.

b) A 3-phase, 50 Hz, 150 Km long line has a resistance, inductive reactance and shunt capacitive admittance of 0.1 Ohm, 0.5 Ohm, and 3×10^{-6} Mho/ Km/ phase. If the line delivers 50 MW at 110 KV and 0.8 pf lagging. Determine the sending end voltage and current. Assume nominal Pi model for the line. [5+5]

6.a) Derive the expressions for reflected voltage and current waves, when the transmission line is terminated by the capacitive load.

b) Define Voltage regulation of a transmission line and explain clearly the Ferranti effect with a phasor diagram. [5+5]

OR

7.a) Deduce expression for velocity of propagation of travelling waves.

b) A cable with surge impedance of 100 Ohms is terminated in two parallel connected open wires having surge impedances of 600 Ohms, and 1000 Ohms respectively. If a steep fronted voltage wave of 2 kV travels along the cable, find the voltage and current in the cable and the open-wire lines immediately after the travelling wave has reached the transition point. Assume voltage wave to be infinite length. [5+5]

8.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.

b) A string of suspension insulators consists of 5 units each having capacitance C. The capacitance between each unit and earth is 1/8 of C. Determine the voltage distribution across each insulator in the string as a percentage of voltage of conductor to earth. If the insulators in the string are designed to withstand 36 kV maximum, calculate the operating voltage of the line where 5 suspension insulator strings can be used. [5+5]

OR

9.a) What is a stringing chart? Explain clearly the procedure adopted for stringing the power conductors on the supports.

b) Determine the maximum sag of an overhead line conductor having a diameter of 19.5 mm weighs 0.85 kg/m. The span length is 275 meters, wind pressure is 40 kg/m^2 of projected area with ice coating of 13 mm. The ultimate strength of the conductor is 8000 kg, the factor of safety is 2 and ice weighs $910kg/m^3$. [5+5]

10.a) What is meant by grading of cables? Explain why and how the grading of cables is done?

b) A single core cable has an inner diameter of 5cms and a core diameter of 1.5cm. Its paper dielectric has a working maximum dielectric stress of 60kV/cm. Calculate the maximum permissible line voltage when such cables are used on a 3-phase power system. [6+4]

OR

11.a) Derive an expression for insulation resistance of a single-core cable.

b) A 3-phase 66kV single-core lead sheathed cable has a conductor of 2cm diameter and two layers of different materials each 1cm thick. The relative permittivity are 5(inner) and 3(outer). Calculate the maximum stress in the two dielectrics. [4+6]

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