Code No: 55011 **R09**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, May/June - 2019
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 concept of GMR and GMD of a transmission line.
b) Derive an expression for the inductance per phase for a 3-phase overhead transmission line when conductors are unsymmetrically placed but lines are un-transposed. [7+8]

2.a) Derive the expressions for the ABCD constants for the nominal- π circuit of a medium transmission line.
b) The following data refers to a 50 Hz, three-phase transmission line: length 10 km; sending-end voltage =11 kV; load delivered at receiving end 100 kW at 0.8 p.f. lag; resistance of each inductor = 0.4 ohms/ km; reactance per phase = 0.45 ohms / km. Find (i) receiving-end voltage (ii) line current and (iii) efficiency of transmission. [7+8]

3. A 345 KV, 50 Hz, 3-phase transmission line is 130km long. The resistance per phase =0.036 ohms/km and inductance per phase is 0.8 mH/km. The shunt capacitance is 0.0112 micro Farad/km. The receiving end load is 270MVA with 0.8 power factor lagging at 325KV. Find the voltage and power at the sending end and the voltage regulation. Use (a) nominal T method (b) nominalπ method (c) ABCD constants. Compare the result. [15]

4.a) Discuss the phenomenon of wave reflection and refraction. Derive an expression for the reflection and refraction coefficients.
b) Two stations are connected together by an underground cable having a surge impedance of 50 ohms joined to an overhead line with a surge impedance of 400 ohms. If a surge having a maximum value of 110 kV travels along the cable towards the junction with the overhead line, determine the value of the reflected and the transmitted wave of voltage and current at the junction. **[7**+8]

5.a) Explain the concept of critical visual disruptive voltage.
b) Find the critical disruptive voltage and the critical voltages for local and general corona on a 3-phase overhead transmission line, consisting of three stranded copper conductors spaced 2.5m apart at the corners of an equilateral triangle. Air temperature and pressure are 21^0C and 73.6 cm Hg respectively. Take conductor dia 10.4mm, irregularity factor 0.85, local and general surface factors 0.7 and 0.8 respectively. [7+8]

6. A three-phase 66KV transmission line is carried by string of 6 suspension insulators. The capacitance of each unit insulator to the capacitance relative to earth is 4:1. Calculate the potential across each unit and the string efficiency. Assume that there is no leakage. [15]

7. An overhead line is erected across a span of 300m on level supports. The conductor has a diameter of 1.42cm and has a dead weight of 1.08Kg per meter. The line is subjected to wind pressure of 37.8Kg per square meter of the projected area. The radial thickness of ice is 1.25cm. Calculate the sag
a) in an inclined direction b) in a vertical direction
Assume a maximum working stress 1,050Kg per sq. cm. One cubic meter of ice weighs 913.5Kg. [7+8]

8.a) Derive an expression for capacitance of a single core cable.
b) A 66-KV single core lead sheathed cable is graded by using two dielectrics of relative permittivity 5 and 3 respectively. Thickness of each dielectric is 1 cm. Determine the maximum electrostatic force in the two dielectrics. [7+8]

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