Code No: R1931021 **R19** **SET - 1**

III B. Tech I Semester Regular Examinations, February-2022

POWER SYSTEMS-II

(**Electrical and Electronics Engineering**)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions **ONE** Question from **Each unit**

All Questions Carry Equal Marks

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UNIT-I

1. a) What factors must be taken into account while calculating the resistance of overhead line conductors? How are these factors accounted for? [6M]

   b) A 400 kV, three-phase bundle conductor line with two sub conductor per phase has a horizontal configuration as shown in Fig.1. Find the inductance per phase, if the radius of each sub conductor is 1.2 cm. [9M]

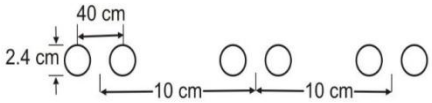

Fig.1

(OR)

2. a) Derive the expression for calculating the internal and external flux linkages for a conductor carrying current. Use this extension to derive the equation for the inductance of a single phase line. [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 2.5 cm. [7M]

UNIT-II

3. a) What do you understand by medium transmission lines? How capacitance effects are taken into account in such lines. [6M]

   b) An overhead 1-phase delivers a load of 1.5 kW at 33 kV at 0.9 p.f. lagging. The total resistance and inductance of the over head transmission line is 8Ω and 15Ω respectively. Determine the following [9M]

   (i) Percentage of voltage regulation
   (ii) Sending end power factor
   (iii) Transmission efficiency

(OR)

4. a) Starting from the first principles, deduce expressions for ABCD constants of a long line in terms of its parameters. [7M]

   b) A 400 kV, 3-phase transmission line has impedance per phase of (50+j100) ohms and an admittance of (0+j002) mho. Using the convergent series method, determine (i) the sending-end voltage and (ii) the sending-end current when the receiving end current is 150 Amps at 0.8 p.f lagging. [8M]

UNIT-III

5. a) Starting from the first principles, show that surges behave as travelling waves. Derive expressions for surge voltage and currents. [8M]
   b) A 220 kV surge travels on a line of 400 Ω surge impedance and reaches a junction where two branch lines of surge impedances 550 Ω and 350 Ω respectively 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]

(OR)

6. a) Obtain the expressions for voltage and current waves meeting at a inductive junction. [7M]
   b) A 500 kV, 2.5 μsec duration rectangular surge passes through a line having surge impedance of 400 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]

UNIT-IV

7. a) Discuss why the receiving-end voltage of an unloaded long line may be more than its sending-end voltage. [7M]
   b) A 3-phase, 220 kV, 50 Hz, over line consists of 2.5 cm diameter conductors spaced 3 meters apart in equilateral triangle formation. Determine the corona loss per km of the line at 20^0C and atmospheric pressure 75 cm of Hg. Take irregularity factor as 0.8. [8M]

(OR)

8. a) Explain the radio interference due to corona. [6M]
   b) A grid line operating at 132 kV consists of 2 cm diameter conductors spaced 4 meters apart. Determine the disruptive critical voltage and visual corona voltage for the following data: temperature 44^0C, barometric pressure 73.7 cm of mercury, conductor surface factor 0.84, and fine weather factor = 0.8, rough weather factor = 0.66. [9M]

UNIT-V

9. a) What is a stringing chart? Explain clearly the procedure adopted for stringing the power conductors on the supports. [8M]
   b) Deduce expressions for calculating sag and conductor length of an overhead line when the supports are at the same level. [7M]

(OR)

10. 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. [7M]
    b) A three phase overhead line is being supported by tree 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 and (iii) the string efficiency. [8M]

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