

2054  
B.E. (Electrical and Electronics Engineering)  
Fourth Semester  
PC-EE-402: Power System - I ✓

Time allowed: 3 Hours

Max. Marks: 50

*NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Part. Assume any missing data.*

x-x-x

1. (a) Differentiate between composite and bundled conductors.  
(b) Advantages of pu representation of quantities.  
(c) Difference between self and mutual GMD.  
(d) Name different layers of UGC with diagram.  
(e) Advantages of string insulators.

(5x2)

**PART A**

2. (a) What is void formation in cables? How does this affect its performance and how it can be prevented?  
  
(b) A 3-phase metal sheathed cable 1 km long gave following test results:  
(i) capacitance between 2 conductors bunched with sheath and the third conductor is  $0.5\mu\text{f}$   
(ii) Capacitance between bunched conductors and sheath is  $1\mu\text{F}$ .  
  
Find capacitance between (i) any two cores (ii) between any two bunched conductors and third conductor (iii) calculate charging current per phase per km when connected to 11kV 50Hz supply. (5,5)
3. Determine voltage across each disc of suspension insulator as percentage of line voltage to earth. Self and capacitance to ground of each disc is C and  $0.2C$  respectively. Capacitance between link pin and guard ring is  $0.1C$ . If capacitance to the line of lower link pin were increased to  $0.3C$  by means of guard ring, find redistribution of voltage. Also, find string efficiency in each case. (10)
4. (a) Explain reflection of travelling waves. Derive formula for reflection coefficient.  
  
(b) What is surge impedance? Evaluate surge impedance for 1-phase overhead transmission line with air as dielectric.

(5, 5)

P.T.O.

(2)

**PART-B**

5. Drive an expression for flux linkages of one conductor in a group of  $n$ -conductors carrying currents whose sum is zero. Hence, derive an expression for inductance of composite conductors of 1-phase line consisting of  $m$ -strands in one conductor and  $n$ -strands in the other conductor.

(10)

6. Determine the inductor per phase per km of a double-circuit 3-phase line. The radius of each conductor is 2 cm and the conductors are placed on the circumference of an imaginary circle of radius 7 m forming a regular hexagon figure.

(10)

7. (a) A short 3-phase transmission line has a series line impedance per phase of  $(20+j50)\Omega$ . The line delivers a load of 50 MW at 0.7pf lagging. Determine regulation of the line and ABCD parameters. If same load is delivered at 0.7 pf lead, determine regulation of line. System voltage is 220kV.

- (b) Discuss classification of transmission lines.

(7,3)

x-x-x