

## Elements of power system

21/11/14

QP Code : 12407

(3 Hours)

[ Total Marks : 80

- N.B. : (1) Question No.1 is **Compulsory**.  
 (2) **Attempt** any 3 questions from **remaining** five questions.  
 (3) **Figures** to the right indicate **full** marks.  
 (4) Make suitable assumptions wherever **necessary**.

1. Attempt any **four** :—
- (a) Draw the model of a short transmission line and derive expression for its voltage regulation. 20
- (b) Prove that pu impedance of a transformer can be made same referred to both the windings by selecting proper voltage bases on either sides.
- (c) Explain skin effect referred to overhead lines.
- (d) Explain pin type insulators.
- (e) Draw single line diagram of a typical ac power supply scheme.
2. (a) Derive expression for inductance of a composite single phase line having composite conductors. Hence explain GMR and GMD. 10
- (b) Find ABCD constants of medium length transmission line represented by Nominal  $\pi$  model. Also draw phasor diagram. 10
3. (a) Describe different methods to improve string efficiency. 10
- (b) A suspension string has three units. Each unit has to withstand a maximum peak voltage of 11 KV. The capacitance of each joint and the metal work is 20% of the capacitance of each disc. Find 10
- (i) Maximum line voltage for which string can be used.
- (ii) String  $\eta$
4. (a) Derive capacitance of a 3- $\phi$  line with unsymmetrical spacing. Assume transposition. 10
- (b) Write short note on grading of cables. 10
5. (a) Derive the expression for sag of a overhead transmission line with supports at same level. What is the effect of ice and wind on it? Assume its shape similar to a parabola. 10
- (b) An overhead line over a river crossing is supported by two towers 50 m and 80 m above the water level. The horizontal span is 300 m. If the weight of the conductor is 8.28 N/m and tension in the conductor is 19620 N. Find the height of midpoint of line above the water level. 10
6. Write short notes on any **two** :— 20
- (a) Power flow through transmission line.
- (b) Measurement of earth resistance and soil resistivity.
- (c) Per unit system and its significance.