

Total No. of Questions—8]

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<b>Seat No.</b>	
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**[4657]-536**

**S.E. (Electrical) (Second Semester) EXAMINATION, 2014**

**POWER SYSTEMS-I**

**(2012 PATTERN)**

**Time : Two Hours**

**Maximum Marks : 50**

**N.B. :—** (i) Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6 and  
Q. 7 or Q. 8.

(ii) Neat diagrams must be drawn wherever necessary.

(iii) Figures to the right indicate full marks.

(iv) Your answers will be valued as a whole.

(v) Assume suitable data, if necessary.

1. (a) What are the advantages of interconnected grid system of power  
generating stations ? [6]

(b) Explain in brief any *one* type of excitation system used for  
alternators. [6]

P.T.O.

*Or*

- 2.** (a) Define string efficiency. Derive the expression for string efficiency of a string consisting of three discs. [6]
- (b) Define Tariff, hence explain desirable characteristics of tariff. [6]
- 3.** (a) Derive the expression for inductance of three phase overhead transmission line when conductors are unsymmetrically placed but transposed. [6]
- (b) An overhead transmission line conductor having parabolic configuration weighs 1.925 kg per meter length, area of cross-section  $2.2 \text{ cm}^2$  and an ultimate strength of  $8000 \text{ kg/cm}^2$ . When erected between supports 600 m apart and having 15 m difference in height, determine the vertical sag from taller of the two supports which must be allowed so that factor of safety shall be 5 with wire loaded due to 1 kg of ice per meter and no wind pressure. [7]

*Or*

4. (a) Calculate loop inductance of 500 m long, 1 phase, 2 wire, 50 Hz transmission line. Each wire has identical cross-sectional area of  $10 \text{ cm}^2$  and conductors are separated by a distance of 5 m. Also calculate inductive reactance. [7]
- (b) Write a short note on XLPE cables. [6]
5. (a) Explain 'Method of Images' in determining the effect of earth on the capacitance calculation for overhead transmission lines. [6]
- (b) A 250 V, 50 Hz 1 phase 40 km long transmission line consisting of 2 parallel wires each 5 mm in diameter and 1.5 m apart. The height of conductors above ground is 7 m. Determine total capacitance of line : [6]
- (i) Considering effect of earth
- (ii) Neglecting effect of earth.

*Or*

6. (a) Derive an expression for capacitance per km of a single phase overhead transmission line with distance 'D' between the conductors and radius of each conductor as 'r' meter. [6]

- (b) Six conductors of a double circuit three phase line are arranged as shown in figure 1. The diameter of each conductor is 2.5 cm. Find capacitance per phase per km assuming that line is transposed. [6]

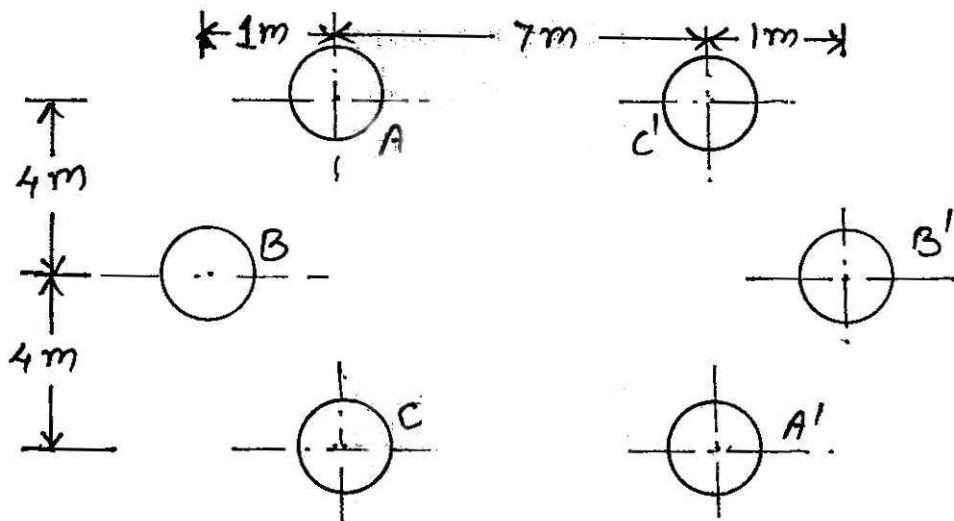


Fig. 1

7. (a) Write a short note on Ferranti Effect. [6]
- (b) A 100 km long 3 phase 50 Hz transmission line has the following line constants :

$$\text{Resistance/phase/km} = 0.1 \, \Omega,$$

$$\text{Reactance/phase/km} = 0.5 \, \Omega,$$

$$\text{Susceptance/phase/km} = 10 \times 10^{-6} \, \text{S}$$

If the line supplies load of 20 MW at 0.9 p.f. lagging at 66 kV at the receiving end, calculate by nominal ' $\pi$ ' method :

- (i) Sending end voltage
- (ii) Sending end current
- (iii) Sending end power factor. [7]

*Or*

8. (a) A balanced 3 phase load of 30 MW is supplied at 132 kV, 50 Hz and 0.85 p.f. lagging by means of transmission line. The series impedance of single conductor is  $20 + j52$  ohms and total phase neutral admittance is  $315 \times 10^{-6}$  Siemens. Using nominal 'T' method, determine :

- (i) ABCD constants
- (ii) Sending end voltage. [7]

- (b) Classify transmission lines based on voltage, length and line parameters. [6]