

Total No. of Questions—8]

[Total No. of Printed Pages—4

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[5152]-146**S.E. (Electrical) (II Semester) EXAMINATION, 2017****POWER SYSTEM—I****(2012 PATTERN)****Time : Two Hours****Maximum Marks : 50**

- N.B. :—** (i) Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.
(ii) Neat diagrams must be drawn wherever necessary.
(iii) Figures to the right indicate full marks.
(iv) Assume suitable data, if necessary.

1. (a) Discuss advantages and limitations of interconnected grid system. [6]
(b) Explain in brief the necessity and working of the following equipments used in substation : [6]
(i) Busbars
(ii) Reactors.

Or

2. (a) What is meant by tariff ? What are the objectives of tariff ? [6]
(b) A 3-phase line is supported by a string of 3 suspension type disc insulators. The voltage across the disc nearest to the

P.T.O.

line is 20 kV and that across the adjacent units is 15 kV.

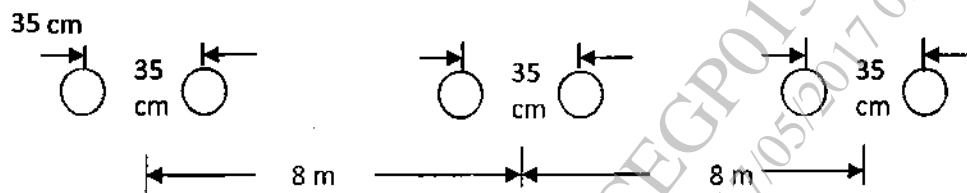
Find :

- (i) ratio of the capacitance of joint to capacitance of disc
- (ii) System line voltage
- (iii) String efficiency. [6]

3. (a) Define Sag and Span of a transmission line. With neat diagram derive an expression for sag when the supports are at equal level. [7]
- (b) What is meant by transposition of conductors in an overhead line ? Why is it essential ? How is it carried out ? [6]

Or

4. (a) A three-phase single circuit bundled conductor line with two sub-conductors per phase has horizontal spacing with 8 m between the centre lines of adjacent phases. The distance between the sub-conductors of each phase is 35 cm and each sub-conductor has a diameter of 2.8 cm. Find the inductance per phase per km of the line. [7]



- (b) Derive an expression for capacitance of a single core cable. [6]

5. (a) Derive an expression for capacitance of 1-phase transmission line without considering effect of earth. [6]
- (b) A 3-phase, 50 Hz, 132 kV overhead line has conductors placed in horizontal plane 4.5 m apart. Conductor diameter is 22.4 mm. Line length is 200 km. Calculate charging current per phase assuming complete transposition. [6]

Or

6. (a) Capacitance of single-phase, 50 km long transmission line considering effect of earth is $0.225 \mu\text{F}$. Overhead line consisting of two parallel conductors each of 0.5 cm diameter and 1.5 m apart. Calculate height of conductors above the ground. [6]
- (b) Derive an expression for capacitance of 3-phase transmission line when conductors are unsymmetrically spaced but transposed. [7]
7. (a) Evaluate the generalized circuit constants for medium transmission line with Nominal ' π ' method. [6]
- (b) Obtain the expression of voltage regulation and efficiency of short transmission line in terms of line parameters. [6]

Or

8. (a) With neat circuit diagram, prove that for any transmission line with generalized circuit constants as ABCD, value of $AD - BC = 1$. [6]

(b) The A, B, C, D constants of a 3-phase transmission line are

$$A = D = 0.978 + j 0.051,$$

$$B = 28.47 + j 106.25 \Omega \text{ and}$$

$$C = j5 \times 10^{-4} \text{ mho.}$$

The load at the receiving end is 40 MW at 200 kV and 0.8 lagging power factor. Determine sending end voltage and % regulation of line. [6]

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