

Total No. of Questions—8]

[Total No. of Printed Pages—3

Seat No.	
-------------	--

[5459]-155

**S.E. (Electrical) (II Semester) Examination, 2018**

**POWER SYSTEM-I**

**(2015 Pattern)**

**Time : Two Hours**

**Maximum Marks : 50**

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

(ii) Neat diagrams must be drawn wherever necessary.

(iii) Figures to the right side indicate full marks.

(iv) Assume suitable data, if necessary.

1. (a) A generating station supplies the following loads : 15,000 kW, 12,000 kW, 8,500 kW, 6,000 kW and 450 kW. The maximum demand is 22,000 kW. The annual load factor of the station is 48%. : [6]

Calculate :

(i) Number of units supplied annually

(ii) Diversity factor

(iii) Demand factor.

(b) Define string efficiency. Derive the expression for string efficiency of a suspension insulator consisting of four discs. [6]

Or

2. (a) Explain in brief, function and working of the following equipments used in substation : [6]

(i) Relays

(ii) PLCC equipment.

(b) Write short notes on the following types of tariffs : [6]

(i) Time of the day tariff

(ii) Interruptible tariff.

P.T.O.

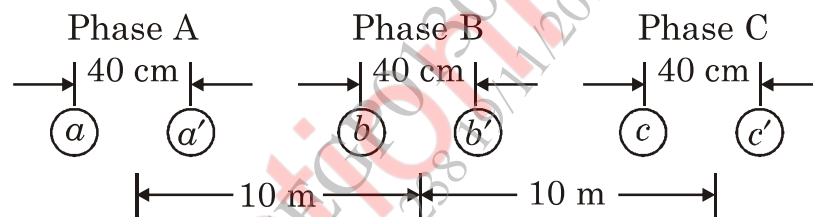
3. (a) Explain in brief with neat diagram the following effects : [6]  
 (i) Skin Effect  
 (ii) Proximity Effect.

Hence state what are the factors responsible for producing these effects and how ?

- (b) The weight of the overhead line conductor is 700 kg/km. The ultimate strength is 3000 kg. If safety factor is 2 and span length is 250 m. Find (i) Sag (ii) Height above which conductor should be supported if ground clearance required is 8 m. [7]

Or

4. (a) 3-phase bundled conductor line consist of 2 sub-conductors per phase, conductors are arranged in horizontal plane and are regularly transposed as shown in figure, radius of each conductor is 1.15 cm. Calculate inductance per phase per km. [7]



- (b) Derive the expression for capacitance of single core cable. [6]
5. (a) Explain the concept of “Method of Images” in determining the effect on the capacitance of overhead transmission line. [6]
- (b) 3-phase, 110 kV, 50 Hz overhead line conductors are placed in a horizontal plane. The conductor diameter is 1.5 cm if the line length is 120 km, assuming complete transposition of the line. Calculate :  
 (i) capacitance per phase  
 (ii) charging current. [6]

Or

6. (a) Derive the expression for capacitance of double circuit line when conductors are arranged in the form of regular hexagon with side ' $d$ ' meters. [6]
- (b) A single-phase 10 km line is 6 m above the ground. The diameter of each conductor is 2 cm and is separated by 4 m horizontally. Find the following : [6]
- (i) Capacitance between the conductors with the effect of ground.
- (ii) Capacitance between the conductors neglecting the presence of ground.
- (iii) Charging current when the line is charged at 33 kV, 50 Hz
7. (a) 150 km, 3-phase, 110 kV, 50 Hz transmission line transmits a load of 40 MW at 0.8 pf lagging at receiving end. Resistance/ph/km = 0.15  $\Omega$ , reactance/ph/km = 0.6  $\Omega$ ; susceptance/ph/km =  $10^{-5}$  S. [7]
- Determine :
- (i) A, B, C, D constants of the line
- (ii) Sending end voltage (line-to-line).
- (b) Justify the following statements : [6]
- (i) In case of medium transmission lines, receiving end voltage is greater than sending end voltage under no load.
- (ii) With increase in power factor, regulation of transmission line improves.

Or

8. (a) Express the relationship for the sending end voltage and current in terms of receiving end voltage and current for a medium length transmission line with Nominal ' $\pi$ ' method of representation. Draw the phasor diagram. [6]
- (b) A 110 kV, 50Hz, 3-phase transmission line delivers a load of 50 MW at 0.85 p.f. lagging at the receiving end. If the generalized constants of the line are  $A = 0.95 \angle 1.4^\circ$ ,  $B = 96 \angle 78^\circ \Omega$  and  $C = 0.0015 \angle 90^\circ$  S. Determine efficiency of transmission line. [7]