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

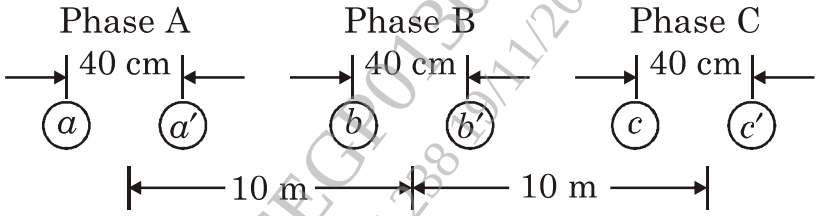
(*ii*) Proximity Effect.

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 lie 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 Ω, reactance/ph/km = 0.6 Ω; 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 'π' 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°, B = 96 $\angle$ = 78°Ω and C = 0.0015 $\angle$90° S. Determine efficiency of transmission line. [7]