Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[5668]-156

S.E. (Electrical) (Sem. II) EXAMINATION, 2019

POWER SYSTEM–I

(2015 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**, Q. **7** *or* Q. **8**.

(*ii*) Neat diagram must be drawn wherever necessary.

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

(*iv*) Assume suitable data, if necessary.

1. (*a*) State following statements are True or False and justify your answer in brief : [6]

(*i*) Utilization factor of plant can be greater than or less than 1

(*ii*) Higher the load factor, lower is the cost of generation

(*iii*) In two part tariff, consumer with low power factor will be charged more on account of demand charges.

(*b*) A 3-phase line is supported by a string of 4 suspension type disc insulators. The voltage across second and third disc are 13.2 kV and 18.2 kV respectively. Calculate voltages across first and last string and voltage between conductors. [6]

P.T.O.

Or

2. (*a*) A generating station has a maximum demand of 500 MW. The annual load factor is 50% and capacity factor is 40%. Find reserve capacity of plant. [6]

(*b*) Explain in brief the necessity and working of the following equipments used in substation : [6]

(*i*) Busbars

(*ii*) Reactors.

3. (*a*) Derive the expression for inductance of 3-phase transmission line when conductors are placed in flat horizontal plane but transposed. [6]

(*b*) Define cable. State various parts of cable and give brief classification of underground cables. [7]

Or

4. (*a*) Elaborate the following effects present in transmission line hence state factors responsible for producing these effects : [6]

(*i*) Skin Effect

(*ii*) Proximity Effect.

(*b*) A 3 core, 3 phase metal sheathed cable gave the following results on testing for cables : [7]

(*i*) capacitance between all conductors shorted and sheathed = 0.90 μF

(*ii*) Capacitance between two conductors shorted with sheath and third conductor = 0.40 μF

Draw neat circuit diagrams in each case and find :

(*i*) capacitance between each conductor and sheath, Cs

(*ii*) capacitance between two cores, Cc

(*iii*) Capacitance to neutral, Cn.

5. (*a*) Explain why effect of earth is required to be considered while calculating capacitance of singlephase transmission line hence derive an expression for capacitance per km of 1 phase transmission line considering effect of earth. [6]

(*b*) Three phase 220 kV line operated at 50 Hz has its conductors arranged in flat vertical configuration. The conductor diameter is 20 mm and spacing between adjacent conductors is 3 meters. Determine capacitance and charging current per unit length of the line. [6]

Or

6. Derive the expression for capacitance per phase per km of 3 phase transmission line with unsymmetrically spaced conductors with the following conditions : [12]

(*i*) Without transposition

(*ii*) With transposition.

7. (*a*) Evaluate the generalized circuit constants for medium transmission line represented by nominal 'Π' method. [6]

(*b*) 3 phase, 66 kV, 50 Hz, 100 km long transmission line supplying

load of 20 MW at 0.8 pf lagging at receiving end. The resistance, reactance and line susceptance per phase are 10 Ω, 35.1 Ω and 3.127×10^{-4} S respectively.

Use nominal 'T' method and determine : [7]

(*i*) Load current

(*ii*) Voltage across capacitor

(*iii*) Charging current

(*iv*) Sending end current

(*v*) Sending end voltage.

Or

8. (*a*) Explain Ferranti effect with the help of phasor diagram. [6]

(*b*) 3 phase short transmission line having resistance 0.4 Ω and reactance of 0.4 Ω is delivering load of 2000 kVA at 0.8 pf lagging at receiving end. If the load voltage is 3000 V, determine voltage regulation and line efficiency. [7]