

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]

- Busbars
- 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]

- Skin Effect.
- 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

[5668]-156

2

Draw neat circuit diagrams in each case and find :

- (i) capacitance between each conductor and sheath, C_s
- (ii) capacitance between two cores, C_c
- (iii) Capacitance to neutral, C_n .

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 'T' 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]