B.E. Electrical (Electronics & Power) Engineering Fifth Semester

EP504 - Electrical Power System-I

P. Pages : 2 **GUG/W/18/1619**

Time : Three Hours * 1 2 7 3 * Max. Marks : 80

Notes : 1. All questions carry equal marks.
2. Assume suitable data wherever necessary.
3. Illustrate your answers wherever necessary with the help of neat sketches.
4. Use of non programmable calculator permitted.

1. a) With neat diagram give the layout of modern power system structure, mentioning the standard voltages at each stages. **8**

b) A single phase 400V ring distributor ABC is fed at 'A'. The loads at 'B' & 'C' are 20 Amp at 0.8 p.f. lagging and 15 Amp at 0.6 p.f. lagging respt. The impedance of three sections AB, BC & CA are (1 + j1), (1 + j2) & (1 + j2) respectively. Find the total current at 'A' and current in each section and voltage sat 'B' & C. Assume voltage of 'A' as reference. **8**

OR

2. a) Explain why for transmission purpose conductors are standard & use in bundle. Give few configuration generally used. Illustrate with neat diagram. **6**

b) What do you mean by skin & proximity effect. **4**

c) List out various equipments used in substation. Give the brief description of each. **6**

3. a) Derive the formula for calculation of inductance 3ϕ transposed lines. **8**

b) A 3ϕ double circuit line has it's conductor at the vertices of regular hexagon with sides of 2.5 m. The radius of each conductor is 2 cm. Find the capacitance of per phase per km. **8**

OR

4. a) Discuss the concept of GMD and GMR. How it is used to find the inductance of the composite conductor lines. **8**

b) Explain the effect of earth on the capacitance calculation of overhead line. Derive the formula for capacitance of single phase solid conductor circuit by considering the effect of earth. **8**

5. a) What are the advantages of per unit system ? Derive the formula for determining per unit reactance for change of base value. **8**

b) Develop the per unit reactance diagram for the power system shown in fig. 5 (b). **8**

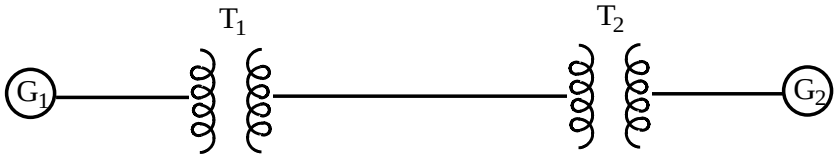

Fig. 5 (b)

Generator G_1 : 30 MVA, 10.5 KVA, $X'' = 1.6\ \Omega$

Generator G_2 : 15 MVA, 6.6 KV, $X'' = 1.2\ \Omega$

Transformer $T_1(3\phi)$: 15 MVA, 33/11KV, X = 15.2 Ω /ph (on HT side)

Transformer $T_2(3\phi)$: 15 MVA, 33/6.2 KV, X = 16 Ω /ph (on HT side)

Transmission line = 20.5 Ω / phase.

OR

6. a) Give the representation of 'nominal-A' circuit for medium length transmission line. Derive generalized constant and develop phasor diagram. **8**

b) A 200 km long three phase overhead line has a resistance of 48.7 ohm per phase line to neutral capacitance of 8.42 nf per km. Inductive reactance of $80.2\Omega/\text{ph}$. It supplies a load of 13.5 mw at a voltage of 88 KV and at a p.f. of 0.9 lag. using nominal 'T' circuit. Find the sending end voltage current regulation and power factor. **8**

7. a) Starting from first principle deduce expression for ABCD constant for long line in terms of it's parameters. Hences define propagation constant and characteristics impedance. **10**

b) Explain Ferranti effect and derive the expression for voltage rise of an unloaded line. **6**

OR

8. a) Write static flow equation & explain it characteristics. **8**

b) Derive 'equivalent-A' circuit model in terms of long line equations. **8**

9. a) What do you mean by string efficiency ? What is it's significance ? Explain the method of improvement of string efficiency. **8**

b) A one km long 11 KV, 3ϕ, 3 core metal sheathed cable gave the following result in test of capacitance - **8**

i) Capacitance between two conductors joined to sheath and third conductor 0.65 μf.

ii) Capacitance between all the three conductors joined together and sheath 0.75 μf

Find :

a) Effective capacitance of each core to the neutral

b) Charging current per phase

c) Capacitance between any two conductors.

OR

10. a) What do you mean by grading of cables ? Explain capacitance grading in details. **8**

b) A suspension string has 3 units. Each withstands a maximum peak voltage of 3 KV. The capacitance of each joint and metal work is 20% of the capacitance of each disc. Find maximum line voltage for which the string can be used & string efficiency. **8**

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