Electrical Power Systems - I

P. Pages : 3

Time : Three Hours

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0860

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Notes : 1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Illustrate your answers whenever necessary with the help of neat sketches.
11. Use of non programmable calculator is permitted.
12. Use graph paper for circle diagram.

1. a) Draw and explain the single line diagram of power system showing various stages along with their voltage levels. **7**

b) Write short note on substation. What are various substations? **6**

OR

2. a) What are the advantages of using high voltage for transmission. Justify your points giving proofs. **7**

b) Write comparison between HVAC and HVDC systems. **6**

3. a) Derive the expression for new per unit impedance in terms of old per unit impedance if (MVA) base & (KV) Base are changed. **5**

b) Fig. shows a two-machine system. The rating are as follows: **8**

Synchronous generator : $20\,MVA, 11\,KV, x'' = j0.15\,pu$

Synchronous motor : $15\,MVA, 11\,KV, x'' = j0.15\,pu$

Transformer T_1 : $25\,MVA, 12.5/132\,KV, x = j0.1$

Transformer T_2 : $20\,MVA, 132/11\,KV, x = j0.1$

Line : $(200 + j500)\,\Omega$.

Draw the impedance diagram for the system. Choose a base voltage of 132 KV for the transmission line and a base voltampere 20 MVA
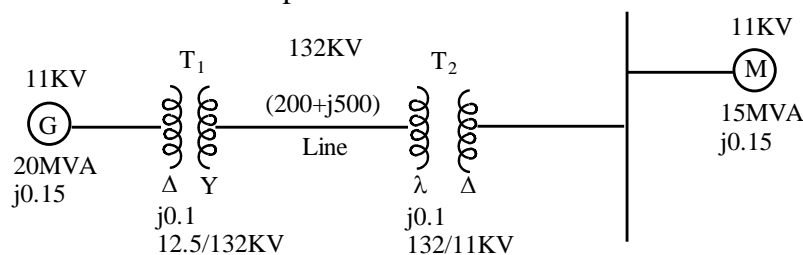
OR

4. a) Derive an expression for composite conductors of a single phase line. **6**

b) Calculate the inductance per phase for the double circuit line. **7**
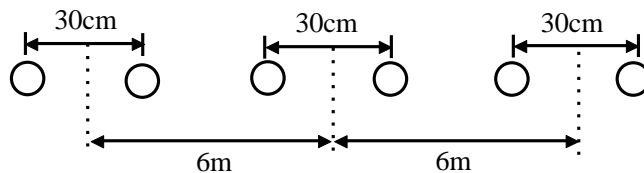
Assume conductor diameter is 2cm

5. a) Write short note on Radial, Ring main and interconnected schemes of distribution system. **5**

b) A two wire dc distributor AB is 2km long and supplies loads of 100A, 150A, 200A and 50A situated at 500m, 100m, 1600m and 2000m respectively from feeding point A. Each conductor has a resistance of 0.01 ohm per 1000m. Calculate potential difference at each load point, if potential at point A is 300V. **6**

c) Write comparison between underground and overhead distribution system. **3**

OR

6. a) Derive expression for voltage distribution of a three disc insulator string. **4**

b) If the capacitance between each insulator Pin and earth is 11% of the self capacitance in 33kv overhead line with 3disc string. Calculate. **5**
   i) Voltage across each unit   ii) String efficiency.

c) What are the various methods of improving string efficiency? **5**

7. a) Derive ABCD parameters of a medium transmission line using nominal T representation. **6**

b) 15000 KVA is received at 33KV at 0.85 power factor lagging over an 8 km three-phase overhead line. Each line has R = 0.29Ω per km, and X = 0.65Ω per km calculate: **8**
   a) The voltage at the sending end
   b) The power factor at the sending end
   c) The regulation and
   d) The efficiency of the transmission line.

OR

8. a) A single circuit 50Hz, 3ϕ transmission line has following parameters: **8**
   R = 0.2 Ω, L = 1.3mH, C = 0.01μF.
   The voltage at receiving end is 132 KV. If line is open at receiving end. Find the rms value and phase angle of the following:
   i) Incident voltage to neutral at receiving end
   ii) Reflected voltage to neutral at receiving end.
   iii) Incident and reflected voltages to neutral at 120 km from receiving end.

b) Write short note on **any two.** **6**
   i) Ferranti effect.
   ii) Surge impedance
   iii) Propagation constant.

9.	a)	How buses are classified in load flow studies?	**6**
	b)	What is the significance of slack bus?	**2**
	c)	Write short note on static load flow equations. (SLFE) in load flow studies.	**5**

OR

10.	a)	What is the significance of load flow analysis?	**6**
	b)	Find Y_{Bus} for the power system shown below Refer fig.10 (b).	**7**

Fig.10(b)
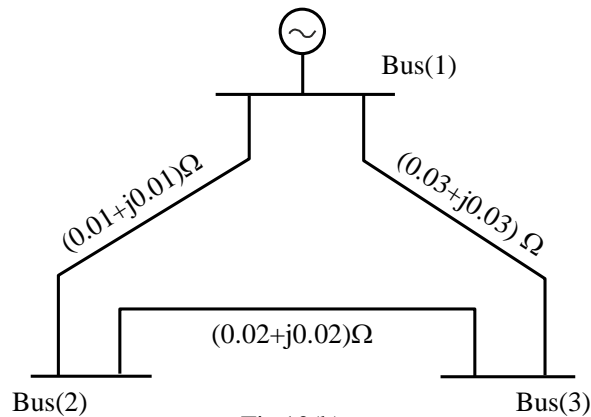
11.	a)	Explain reactive power sharing between two alternators in parallel.	**6**
	b)	Two alternators rated 200MW and 400 MW are operated in parallel. The droop characteristics of their governor are 4% and 5% from NL to FL respectively. They are operated at 50Hz on no load. How would they share a load of 600 MW? What would be the system frequency? Repeat the problem if both governors have 4% droop.	**7**

OR

12.		Write short note on:	
	i)	Automatic Voltage Regulator (AVR).	**4**
	ii)	Load frequency controller with turbine speed governing system.	**5**
	iii)	Reactive power injection.	**4**

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