B.E. (with Credits)-Regular-Semester 2012-Electrical Engineering & (E. & P.) Sem V

EP504 - Electrical Power System-I

P. Pages : 3 **GUG/W/16/3725**

Time : Three Hours * 3 9 6 0 * Max. Marks : 80

Notes : 1. All questions carry equal marks.
2. Illustrate your answers wherever necessary with the help of neat sketches.
3. Due credit will be given to neatness and adequate dimensions.
4. Assume suitable data wherever necessary.
5. Use of non programmable calculator is permitted.

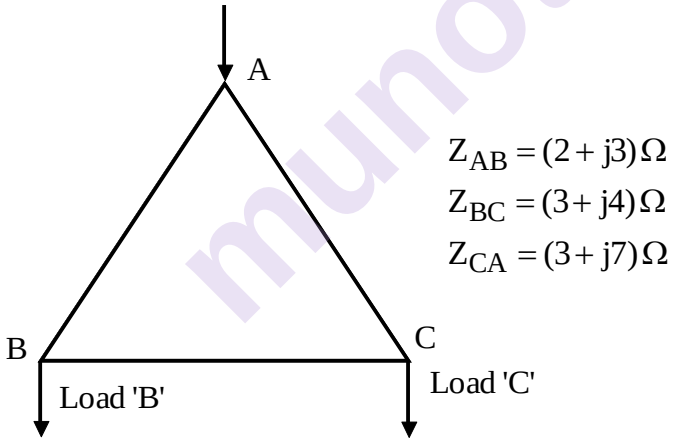
1. a) Explain why for transmission purpose conductors are stranded & used in bundled ? Give few configurations generally used. Illustrate with neat diagram. **6**

b) What do you mean by skin & proximity effect? **5**

c) Give the sample structure of modern power system with single line diagram. **5**

OR

2. a) A 3-ϕ, 11 kv feeder is supplied at 'A', balanced load at 'B' & 'C' are 50 Amp at 0.85 p.f. lagging & 45 Amp. At 0.9 p.f. lagging respectively. The power factors are referred to voltage at 'A'. **6**
Find the current in each feeder & voltages at 'B' & 'C' (refer fig. Q. 2. a)



(Fig. Q. 2, b)

b) Compare UG system with OH system. **5**

c) Explain with neat diagram the principle of interconnected distribution system. **5**

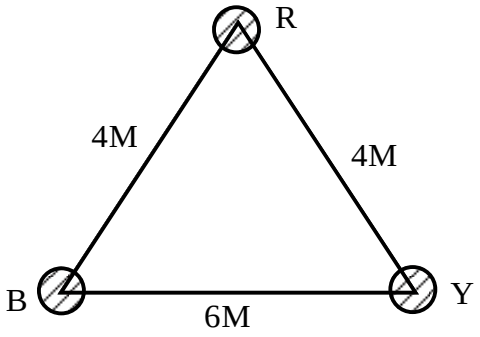
3. a) Derive the formula for calculating inductance of 3-ϕ transposed lines. **8**

b) A 3-ϕ double circuit line has its conductors at the vertices of the regular hexagon with sides of 2.5 M. The radius of each conductor is 2 cm. Find the inductance per phase per km. **8**

OR

4. a) What is the effect of earth on calculation of capacitance of 3-ϕ, overhead transmission line? Derive the formula for capacitance to neutral of 1-ϕ circuit by taking into account this effect. **8**

b) A 3-ϕ transmission line having configuration as shown in fig. Q. 4 b used to supply a voltage at 220 kv & 50 Hz frequency. Diameter of each conductor is 3.6 cm. Determine capacitance to neutral & charging MVAR. Length of line is 200 km. Assume line is equilaterally transposed. **8**



(Fig. Q. 4 b)

5. a) A 200 km long, $3-\phi$ OH line has a resistance and reactance of 48.7Ω & 80.2Ω per phase respectively. Line to neutral capacitance of 8.42 nf per km. It supplies a load of 13.5 MW at a voltage of 88 kv & a power factor of 0.9 lagging. Using nominal - T circuit model, find the sending end voltage, current, regulation & power angle. **8**

b) Give the representation of 'nominal - π' circuit model for transmission line & derive ABCD constants. Also draw the vector representations. **8**

OR

6. a) Derive the formula for regulation & efficiency of short transmission lines. What is the condition for zero voltage regulation. **6**

b) A 300 MVA, 20 kv, $3-\phi$ generator has a sub transient reactance of 20%. The generator supplies a number of synchronous motors over a 64 km long transmission line, having a transformers at both ends. The motors are represented by just two equivalent motors. Rated inputs to the motors are 200 MVA & 100 MVA for M_1 & M_2 respectively. For both motors X" = 20%. The three phase transformer - T, at the generator end is rated 350 MVA, 230/20 kV with leakage reactance of 10%. Transformer T_2 at the load end is rated 3000 MVA, 220/13.2 kV with leakage reactance of 10% series reactance of transmission line is $0.5\ \Omega/\text{km}$. Draw the reactance diagram with all reactances marked in per unit. Select the generator rating as a base in the generator circuit. **10**

7. a) Derive the formulae for obtaining active & reactive powers at sending end & receiving end of transmission line in terms of its generalized constants. **8**

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

OR

8.	a)	Explain the significance of load flow analysis & give SLF equations.	**6**
	b)	Explain various buses used in power system. What is slack bus ?	**5**
	c)	Explain Ferranti effect.	**5**
9.	a)	Classify various types of transmission line insulators give brief characteristics of each of above types.	**8**
	b)	A 3 units insulator string is fitted with a guard ring. The capacitance of the link pins to metal work & guard ring can be assumed to be 20% & 10% of the capacitance of each unit. Determine voltage distribution & string efficiency.	**8**

OR

10.	a)	Explain with neat diagram, structure of single core cable.	**6**
	b)	Explain capacitance grading of the cables. Derive necessary equation.	**6**
	c)	Derive the formula for determining dielectric loss in the cables.	**4**

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