

B.E. (EE) Part-III 6th Semester Examination, 2010

Power System-II

(EE-602)

Time : 3 hours

Full Marks : 70

Use separate answerscript for each half.
Answer SIX questions, taking THREE from each half.
Two marks are reserved for neatness in each half.

FIRST HALF

1. a) What is restriking voltage in a circuit breaker? Define RRRV and obtain an expression of the restriking voltage.
b) Analytically establish the role of the switching resistor in suppressing the over voltage and reducing the frequency of the restriking voltage during breaker operation while interrupting or fault current. 16+5

2. a) A circuit breaker is used to protect a power system against fault and is placed at the incomer side of the three phase supply bus. If the voltage of the bus is 7.5 kV (phase to neutral), system reactance is 4 ohms and the distributed capacitance of the connected system is 0.01 uF (resistance being negligible), find the maximum voltage across the contacts of the circuit breaker when it interrupts a short circuit current at its current zero. Assume system frequency to be 50 Hz and find the frequency of the transient recovery voltage and average rate of rise of voltage upto the first peak of the oscillation.
b) Why do we prefer sulphur hexafluoride breakers at 400 kV and above?
c) Why vacuum interrupters are not usually used beyond system voltage of 11 kV? |5+3+3|

3. a) What are the different types of HVDC links? State their merits and demerits.
b) Why reactive power compensation is needed at HVDC stations?
c) What is the role of the smoothing reactor in HVDC lines? 15+3+3|

4. a) Define cutoff current and prospective current of a fuse. Why do we prefer HRC fuse over ordinary rewirable fuse?

- b) Derive expressions of the reflected and transmitted voltage and current waves for a travelling surge of a voltage wave meeting a junction of two dissimilar lines.
- c) What is a surge diverter? What is its function? [4+4+31]
5. a) Develop expressions for reflection coefficient for the voltage and current wave in case of travelling wave propagation in a line having surge impedance RQ being terminated by a load impedance R_L . What will be the values of these reflection coefficients if the load impedance be replaced by either open circuit or short circuit?
- b) An overhead line has a characteristic impedance of 400 ohms and a voltage wave of $V = 600(e^{t/0.141} - e^{-t})$ is travelling along it. At a certain point the overhead line terminates and the circuit is continued by two parallel overhead line transformer feeders each of which has a characteristic impedance of 400 ohms. The transformers are protected by surge diverters each having effective characteristic impedance of 50 ohms. Without considering the relative transformer characteristic impedance, what is the maximum voltage which would initially appear across the feeder end of winding each transformer? [15+6]

SECOND HALF

6. a) What is the significance of sub-transient reactances in short circuited studies?
- b) What is meant by doubling effect?
- c) Draw the wave form of a short circuit current on a transmission line.
- d) Define D.C. off-set current.
- e) Generator emf is 1 pu. and the transient reactance is 25%. Find the transient current. [2+2+2+2+3J]
7. a) Prove that the reactance inside the alternator is time varying in nature.
- b) For the radial network shown in Fig.-1, a three phase fault occurs at F. Determine the fault current and the line voltage at 11 kV bus under fault conditions. [5+5J]
8. a) Explain the functions of reactors in power systems. What are the different types of reactors commonly used?

- b) Write notes on :
 - (i) Selection of reactors,
 - (ii) Location of reactors. [5+3+3]

- a) Explain the phenomenon "CORONA".
- b) Derive the mathematical expression for critical disruptive voltage for a 3-phase transmission line.
- c) Write down the advantages and disadvantages of corona. [3+5+3]

- 10. Write short notes on (any two) : [8/.x2[
 - a) Load-Frequency control,
 - b) Algorithm for Short Circuit studies,
 - c) Power circle diagram,
 - d) Factors affecting corona loss.

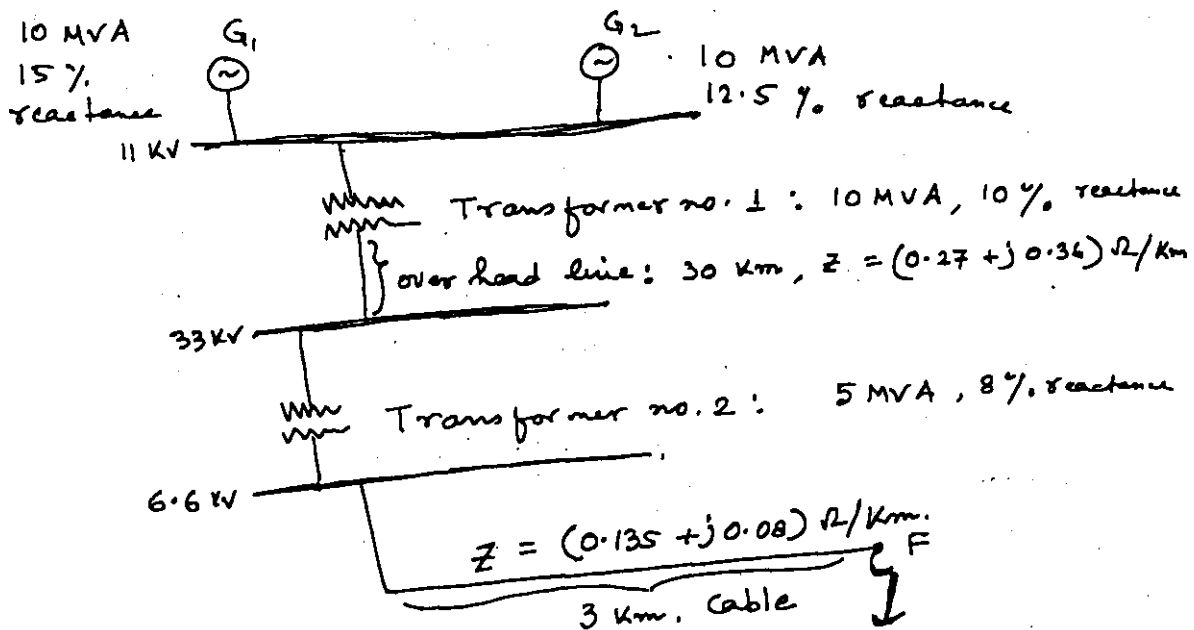


Figure-1