Name : ....

Roll No. : ....

Invigilator's Signature : ....

CS/B.Tech (EEE)/SEM-7/EEE-701/2009-10
2009
POWER SYSTEM – II

Time Allotted : 3 Hours   Full Marks : 70

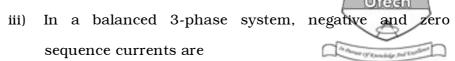*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words
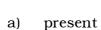as far as practicable.*

GROUP – A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the
    following :   10 × 1 = 10

    i)   When all the phases are short-circuited it gives rise to

          a)   symmetrical fault current

          b)   unsymmetrical fault current

          c)   both symmetrical and unsymmetrical fault
                currents

          d)   none of these.

    ii)   The most common type of fault in overhead line is

          a)   single line to ground   b)   double line to ground

          c)   line to line   d)   none of these.

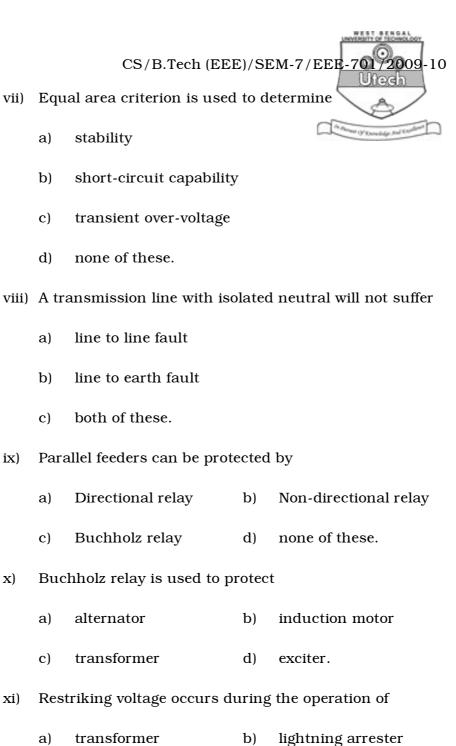77516   [Turn over

iii) In a balanced 3-phase system, negative and zero sequence currents are

a) present

b) absent

c) only negative sequence is present

d) only zero sequence is present.

iv) In a 3-phase, 4-wire unbalanced system, the magnitude proportion of zero sequence current in neutral wire is

a) $\dfrac{1}{2}$

b) $\dfrac{1}{3}$

c) 0

d) none of these.

v) Compared to *d.c.* circuit, *a.c.* circuit interruption is

a) difficult

b) easier

c) the same

d) none of these.

vi) Current chopping mainly occurs in

a) oil circuit breaker

b) air circuit breaker

c) air blast circuit breaker

d) SF_6 circuit breaker.

vii) Equal area criterion is used to determine

    a)   stability

    b)   short-circuit capability

    c)   transient over-voltage

    d)   none of these.

viii) A transmission line with isolated neutral will not suffer

    a)   line to line fault

    b)   line to earth fault

    c)   both of these.

ix) Parallel feeders can be protected by

    a)   Directional relay   b)   Non-directional relay

    c)   Buchholz relay   d)   none of these.

x) Buchholz relay is used to protect

    a)   alternator   b)   induction motor

    c)   transformer   d)   exciter.

xi) Restriking voltage occurs during the operation of

    a)   transformer   b)   lightning arrester

    c)   circuit breaker   d)   none of these.

GROUP – B
(Short Answer Type Questions)

Answer any *three* of the following.   3 × 5 = 15

2. a) What do you understand by percentage reactance ?

    b) Why is the reactance expressed in per cent in short-circuit calculations ?

3. Why do we use reactors in power system ? Discuss their advantages.

4. Define sequence impedances.

5. Explain the working principle of electromagnetic relay.

6. What is a fuse ? Bring out the difference between fuse and circuit breaker.

GROUP – C
(Long Answer Type Questions)

Answer any *three* of the following.   3 × 15 = 45

7. a) Define the following terms :

    i)   Recovery voltage

    ii)   Rate of rise of restriking voltage

    iii) Resistance switching.

b) In a 220 kV system, the reactance and capacitance upto the location of circuit breaker is 8 Ω and 0·25 μF respectively. A resistance of 600 Ω is connected across the contacts of the circuit breaker. Determine the following :

i) Damped frequency of oscillation

ii) Critical value of resistance which will give no transient oscillation. 7 + 8

8. a) Define critical clearing angle.

b) Explain what is equal area criterion.

c) A 50 Hz generator is delivering 60% of the power that it is capable of delivering through a transmission line to an infinite bus. A fault occurs that increases the reactance between the generator and the infinite bus to 400% of the value before the fault. When the fault is isolated, the maximum power that can be delivered is 75% of the original maximum value. Determine the critical clearing angle for the condition described.

2 + 5 + 8

9. a) Discuss the problems in a circuit breaker associated with the interruption of

    i) low inductive current

    ii) capacitive current.

   b) Discuss the operating principle of SF_6 circuit breaker. What are its advantages over other types of circuit breakers ? 7 + 8

10. a) Define steady state stability.

   b) Explain what is meant by swing equation.

   c) A 50 Hz synchronous generator is connected to an infinite bus through a line. The p.u. reactances of the generator and the line are j 0·3 p.u. and j 0·2 p.u. respectively. The no-load voltage of the generator is 1·1 p.u. and that of infinite bus is 1·0 p.u. The inertia constant of the generator is 3 MW-sec/MVA. Determine the frequency of natural oscillation under small perturbation if the generator is loaded to 80% of the maximum power transfer capacity. 3 + 4 + 8

11. Write short notes on any *three* of the following :   3 × 5

   a)   Transient stability

   b)   Vacuum circuit breaker

   c) SF_6 circuit breaker

   d)   Negative sequence network

   e)   Impedance relays.