Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH (EE-NEW)/SEM-6/EE-602/2010

2010

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) Circuit breakers usually operate under

a) steady short circuit current

b) sub-transient state of short circuit current

c) transient state of short circuit current

d) none of these.

ii) Zero sequence fault current is absent when fault is

a) single line to ground fault

b) line to line-like-ground fault

c) double line to ground fault

d) line to line.

iii) Plug setting of an electromagnetic relay can be altered by varying
   a) number of ampere turns
   b) air gap of magnetic path
   c) adjustable back stop
   d) none of these.

iv) A three phase breaker is rated 2000 MVA, 33 kV. Its making current will be
   a) 35 kA b) 49 kA
   c) 70 kA d) 89 kA.

v) A Mho relay is a
   a) voltage restrained directional relay
   b) voltage controlled over current relay
   c) directional restrained over current relay
   d) directional restrained over voltage relay.

vi) The Buchholz relay protects a transformer from
   a) types of internal faults
   b) a turn to turn fault
   c) winding to winding fault
   d) none of these.

vii) For complete protection of a 3-phase line
   a) three-phase and three-earth fault relays are required
   b) three-phase and two-earth fault relays are required
   c) two-phase and two-earth fault relays are required
   d) two-phase and one-earth fault relays are required.

viii) A distance relay is said to be inherently directional if its characteristics on *R-X* diagram
   a) is a straight line off-set from the origin
   b) is a circle that passes through the origin
   c) is a circle that encloses the origin
   d) always a separate directional relay is required.

ix) For a load-flow solution the quantities normally specified at a voltage controlled bus are

a) P and Q b) P and $|V|$

c) Q and $|V|$ d) P and δ .

x) A transformer rated for 500 kVA, 11 kV/0·4 kV has an impedance of 10% and is connected to an infinite bus. The fault level of the transformer is

a) 500 kVA b) 5000 kVA

c) 500 MVA d) none of these.

xi) The voltage of a particular bus can be controlled by controlling

a) phase angle

b) reactive power of the bus

c) active power of the bus

d) phase angle and reactive power.

GROUP – B

(Short Answer Type Questions)

Answer any *three* from the following. $3 \times 5 = 15$

2. Write short notes on any *two* of the following : $2 \times 2\frac{1}{2}$

a) Buchholz relay

b) 'High resistance' and 'zero point' interruption of arc in a circuit breaker

c) Switch gear and circuit breaker

d) SF6 circuit breaker.

3. Derive the torque equation of an induction disc relay.

4. What are the factors to be considered for site selection of

a) Nuclear Power Plant ?

b) Hydro-electric Power Plant ?

5. Draw the schematic diagram of harmonic restraint differential protection scheme used for a Yd11 transformer. Explain the scheme.

6. Define (i) Percentage Reactance, (ii) Percentage Reactance at base kVA and (iii) Short circuit kVA.

GROUP – C

(Long Answer Type Questions)

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

7. Explain the necessity of load flow studies in power system. Derive static load flow equations for 2 bus system. Develop the real power and reactive power balance equation. Hence comment on the real and reactive power losses in transmission lines. 4 + 6 + 3 + 2

8. Distinguish between voltage control bus and swing bus. What do you mean by Jacobian Matrix ? Discuss the NR method of solving SLFE and develop the corresponding flow chart. 4 + 3 + 3 + 5

9. a) Explain the following terms :
   i) Restriking voltage
   ii) Recovery voltage
   iii) RRRV.
   b) Explain different methods of arc extinction in a circuit breaker.
   c) An 11 kV, 500 MVA circuit breaker suddenly closes on to a fault. Determine
   i) the symmetrical breaking current
   ii) the asymmetrical breaking current assuming 50% D.C. component
   iii) the peak making current
   iv) the short time current rating. 6 + 4 + 5

10. a) A 3-phase, 20 MVA, 10 kV alternator has internal reactance of 5% and negligible resistance. Find the external reactance per phase to be connected in series with the alternator so that steady current on short circuit does not exceed 8 times the full load current.
    b) Three resistors of 50 Ω , 100 Ω and 200 Ω are connected in delta across the three phases of a balanced 100 volts supply. What are the sequence components in the resistors and in supply lines ? 10 + 5

11. What do you mean by Symmetrical & Unsymmetrical faults in a 3-ϕ power system ? Deduce the mathematical expression of force developed in an induction cup relay. 8 + 7