



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.



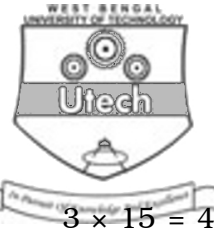
- ix) For a load-flow solution the quantities normally specified at a voltage controlled bus are
- $P$  and  $Q$
  - $P$  and  $|V|$
  - $Q$  and  $|V|$
  - $P$  and  $\delta$ .
- x) A transformer rated for 500 kVA, 11 kV/0.4 kV has an impedance of 10% and is connected to an infinite bus. The fault level of the transformer is
- 500 kVA
  - 5000 kVA
  - 500 MVA
  - none of these.
- xi) The voltage of a particular bus can be controlled by controlling
- phase angle
  - reactive power of the bus
  - active power of the bus
  - 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 :  $2 \times 2\frac{1}{2}$
- Buchholz relay
  - 'High resistance' and 'zero point' interruption of arc in a circuit breaker
  - Switch gear and circuit breaker
  - 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
- Nuclear Power Plant ?
  - 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.  $3 \times 15 = 45$

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  $50 \Omega$  ,  $100 \Omega$  and  $200 \Omega$  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- $\phi$  power system ? Deduce the mathematical expression of force developed in an induction cup relay.  $8 + 7$