



Name :

Roll No. :

Invigilator's Signature :

CS/B.TECH (EEE)/SEM-7/EEE-701/2012-13

2012

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 the following : $10 \times 1 = 10$

- i) The most suitable circuit breaker for short line fault without switching resistor is
 - a) Air blast circuit breaker
 - b) M.O.C.B.
 - c) SF 6 breaker
 - d) none of these.
- ii) Overload protection is generally not provided for
 - a) transformers
 - b) alternators
 - c) inductors
 - d) busbars.



- iii) The relay operating coil is supplied through
 - a) potential transformer
 - b) current transformer
 - c) power transformer
 - d) instrument transformers.
- iv) Mho relay is usually employed for the protection of
 - a) short lines
 - b) medium lines
 - c) long lines
 - d) none of these.
- v) In a load flow study a PV bus is treated as PQ bus when
 - a) active power limit is violated
 - b) voltage limit is violated
 - c) phase angle limit is violated
 - d) none of these.
- vi) Load flow study is carried out for
 - a) fault calculation
 - b) stability study
 - c) system planning
 - d) load frequency control.
- vii) If a fault current is 2000A, the relay setting 50% and the C.T. ratio is 400/5, the P.S.M. will be
 - a) 25 A
 - b) 15 A
 - c) 50 A
 - d) none of these.



viii) The unit of inertia constant H is

- | | |
|--------------|---------------|
| a) MJs / MVA | b) MJ / MVA |
| c) kV / MVA | d) rad / MVA. |

ix) Zero sequence fault current is absent when the fault is

- | | |
|----------|-------------------|
| a) S-L-G | b) L-L |
| c) L-L-G | d) none of these. |

x) A 3-phase breaker is rated at 2000 MVA, 33 kV, its making current will be

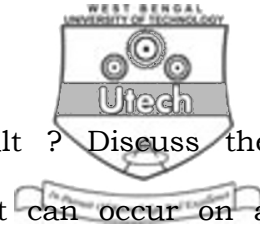
- | | |
|----------|-------------------|
| a) 35 kA | b) 49 kA |
| c) 70 kA | d) none of these. |

GROUP – B

(Short Answer Type Questions)

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

2. What is the reason of 'Chattering' noise in *ac* electromagnetic attraction type relay ? Explain.
3. Explain the working principle of induction type relay.
4. What is the 'accelerating factor' ? Why it is used in load flow studies ?
5. Proof the statement "One machine connected in infinite bus is equivalent to two machine connected in same bus."



6. What is a 3-phase unsymmetrical fault ? Discuss the different types of symmetrical fault that can occur on a 3-phase system.

GROUP – C

(Long Answer Type Questions)

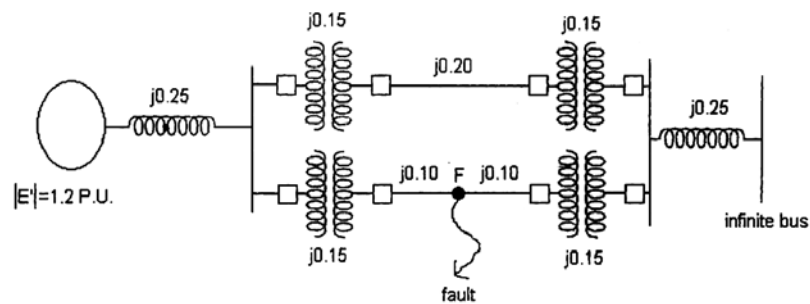
Answer any *three* of the following. $3 \times 15 = 45$

7. a) Explain the following term :
- i) Restriking voltage
 - ii) Recovery voltage
 - iii) RRRV.
- b) Explain different methods of arc extinction in a circuit breaker.
- c) A 50 Hz, 11 kV, 3-phase, neutral earthed alternator is connected to the bus bar through a circuit breaker. the system has inductive reactance of $50 \Omega/\text{phase}$ and capacitance of $0.02 \mu\text{F}/\text{phase}$. A fault occurs just beyond the circuit breaker, which opens when the symmetrical short circuit current is 7500 A. Assuming the resistance of the generator to be negligible.
- Calculate
- i) Maximum voltage across the contacts of breaker
 - ii) Frequency of oscillations
 - iii) Maximum value of RRRV.

$$(2 + 2 + 2) + (3 + 3 + 3)$$



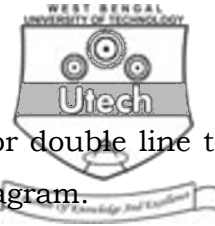
8. a) What do you mean by critical clearing angle ? Obtain an expression for the critical clearing angle and critical clearing time with the aid of equal area criterion.
- b) Find the critical clearing angle for the system shown in the figure for a three phase fault at the point 'F'. The generator is delivering 1.0 P.U. power under pre fault condition.



8 + 7

9. a) Explain clearly the basic principle of operation of a differential relay. What is meant by per cent bias ? How is this achieved in practice in differential relay ? Under what circumstances is a percentage differential relay preferred over differential relay ?
- b) Explain the construction and operation of Buchholz relay.

9 + 6



10. a) Derive the expression of fault current for double line to ground fault. Also draw the sequence diagram.
- b) Three 6.6 kV, 12 MVA, 3 phase alternator are connected to a common set of busbars. Each has a positive sequence reactance 15%. The negative sequence reactance and zero sequence reactance are 75% and 30% of the positive sequence reactance value respectively. If an earth fault occurs on one busbar, determine the fault currents in the following cases :
- when all the alternator neutrals are solidly earthed
 - when only one of the alternators neutral is solidly earthed and others are isolated
 - when one of the alternators neutral is earthed through a resistance of 0.25Ω and others are isolated.
- 7 + 8
11. a) Compare Gauss Siedel and Newton Raphson method for the load flow analysis.
- b) Data for the four bus interconnected power system is given as follows :

Line data

Line	Resistance (p.u.)	Reactance (p.u.)
1-2	0.05	0.15
1-3	0.1	0.3
2-3	0.15	0.45
2-4	0.1	0.3
3-4	0.05	0.15



Bus data

Bus	P_i (p.u.)	Q_i (p.u.)	V_i (p.u.)
1-Slack	—	—	$1.04 \angle 0^\circ$
2-PQ	0.5	- 0.2	—
3-PQ	- 1.0	0.5	—
4-PQ	0.3	- 0.1	—

Determine

- The Y Bus Matrix
- Find voltage (p.u.) at Bus 2 after one iteration.

5 + 5 + 5

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