$\boxed{\textbf{Set No. 1}}$

III B.Tech II Semester Supplimentary Examinations, Apr/May 2008
POWER SYSTEMS-III
(Electrical & Electronic Engineering)

Time: 3 hours   Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks
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1. (a) Explain briefly about traveling waves on Transmission lines.

   (b) Derive the equations for voltage and current Traveling waves for a single circuit two conductors.   [8+8]

2. (a) How do earthing screen and ground wires provide protection against direct lightning strokes?

   (b) Explain why the surge diverters are located very close to the equipments to be protected and mention the application of surge absorbers.   [8+8]

3. A 50 Hz, 11 kV, three phase alternator with earthed neutral has a reactance of 5 ohm/phase and is connected to the bus-bar through a circuit breaker. The capacitance to earth between the alternator and the circuit breaker is 0.02 microfarad per phase. Assume the resistance of the generator to be negligible. Calculate the following.

   (a) Maximum value of voltage across the contacts of the circuit breaker

   (b) Frequency of oscillation

   (c) The average rate of rise of restriking voltage up to first peak   [6+4+6]

4. Explain direct testing of circuit breakers with a neat diagram.   [8+8]

5. (a) Explain clearly the basic principle of Percentage Differential relay for
      i. Internal fault
      ii. Through fault.   [4+4]

   (b) Explain what you understand by pick− up and reset value of the actuating quantity. Explain the term selectivity in protective relays.   [2+2+4]

6. (a) Where are the relays having extremely inverse and very inverse characteristics used? What types of characteristics are used for protecting rectifiers, and for replacement of fuses?   [4+4]

   (b) Explain how the mho characteristic realized using a sampling comparator? [8]

7. (a) What is a direct connected generator?

   (b) Mention protective schemes for a direct connected generator. Explain any one of these schemes.   [6+5+5]

8. (a) Discuss the choice between impedance, reactance and Mho type relays. [2+2+2+2]

(b) Transformer: 5 MVA, Y / Δ, X=6%
The transmission line sections AB and BC are to be protected by Mho distance relays. The system is as shown in the figure8b. If the C.T. ratio is 300/5 and C.T. ratio is 166000/110V and a 3-Ø short circuit fault of zero impedance occurs at F, find the impedance seen by the relays and determine the setting of the relays for high speed protection of line AB and backup protection for line BC, when the relays are located at end A.   [8]
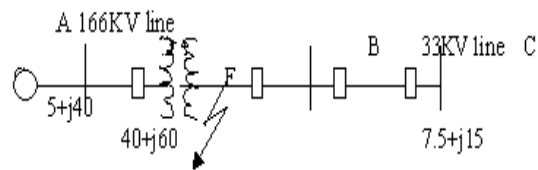

Figure 8b

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Set No. 2

III B.Tech II Semester Supplimentary Examinations, Apr/May 2008
POWER SYSTEMS-III
(Electrical & Electronic Engineering)

Time: 3 hours   Max Marks: 80

Answer any FIVE Questions
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1. A surge of 100KV travels along an overhead line towards its junction with a cable. Find the magnitude of surge transmitted over the cable provided the surge impedance of the line and cable are 400 ohms and 50 ohms respectively.   [16]

2. (a) Distinguish between neutral earthing and equipment earthing .
   (b) Explain the necessity of reactance grounding.   [4+4+8]

3. For a 32 kV System reactance and capacitance up to the location of the circuit breaker is 3 ohms and 0.015 microfarad, respectively. Calculate the following

   (a) The frequency of transients oscillation
   (b) The maximum value of restriking voltage across the contacts of the circuit breaker
   (c) The maximum value of RRRV.   [6+4+6]

4. Write short notes on the following.   [4x4=16]

   (a) Making capacity
   (b) Short time current rating
   (c) Rated voltage, current and frequency
   (d) Rated operating duty

5. (a) What is meant by directional feature of a directional over current relay? Describe the construction, principle of operation and application of a directional over current relay.   [2+2+2+2]
   (b) What is the difference between a polarized mho and simple mho relay. What are self-polarized and cross-polarized mho relays?   [4+4]

6. (a) Write short notes on an amplitude /pulse width converter as applied in a phase sensitive amplitude comparator.   [8]
   (b) Write short notes on:
      i. static sine comparator
      ii. integrating type amplitude comparator.   [4+4]

7. (a) 3300 V, 3 phase turbo alternator has a maximum continuous rating of 2000 kW at 0.8 p.f and reactance is 12.5%. It is equipped with Merz-Price circulating current protection which is set to operate at fault currents not less than 200A. Find what value of the neutral earthing resistance leaves 10% of windings unprotected.

(b) Describe percentage differential protection for transformers. State the advantages. [8+6+2]

8. (a) With a neat sketch, discuss the differential scheme for bus zone protection.

(b) Discuss the working principle of frame leakage protection. [8+8]

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1. Discuss why

   (a) A traveling wave is usually represented as a step wave in the analysis.

   (b) The inductor transformers are usually connected to the over head line through short lengths of cable.   [8+8]

2. Define the following terms:-

   (a) Dry flash over voltage

   (b) Wet flash over voltage

   (c) Impulse flash over voltage

   (d) Impulse spark over volt-time characteristics.   [4+4+4+4]

3. In a 132 kV system, inductance and capacitance up to the location of the circuit breakers are 0.4 H and 0.015 microfarad respectively. Determine

   (a) The maximum value of restriking voltage across the contact of the circuit breakers.

   (b) Frequency of transient oscillations and the maximum value of RRRV.   [8+8]

4. Explain direct testing of circuit breakers with a neat diagram.   [8+8]

5. Determine the time of operation of the relays placed at location No. 1 and 2 assuming that fault current is 2000 amps, C.T.ratio 200/1, relay 1 set at 100% and 2 at 125% and that the relay No.1 has a time multiplier of 0.2. The time grading margin between the relays is 0.5. sec for discrimination. Assume the relay to have 2.2 seconds I.D.M.T. Characteristic, shown in figure 5.   [8+8]
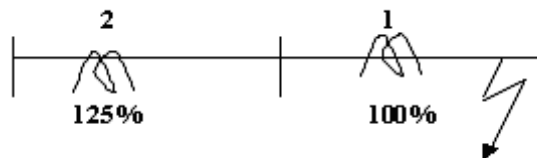

Figure 5

6. (a) Explain the merits and demerits of static relays.

   (b) Discuss how an amplitude comparator can be converted into a phase comparator and vice versa.   [8+8]

7. Show in detail, the protection arrangement of a 60 MW generator provided with

   (a) Differential protection

   (b) Back-up over − current protection through faults

   (c) standby earth fault protection in neutral connection. [6+4+6]

8. (a) With a neat sketch, discuss the differential scheme for bus zone protection.

   (b) Discuss the working principle of frame leakage protection. [8+8]

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$\boxed{\textbf{Set No. 4}}$

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Time: 3 hours   Max Marks: 80

Answer any FIVE Questions
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1. (a) A rectangular surge of 1000 kv incident on a over head transmission line of surge impedance of 300 Ω, meets a junction of two cables of surge impedance 150 Ω and 100 Ω. Calculate the outgoing voltages and currents on each cable and also the over head line. Derive the formula used.

   (b) Explain briefly about equivalent circuit for traveling wave studies. [4+4+8]

2. Describe the construction and working principle of a zinc oxide gapless arrester with a neat sketch. [8+8]

3. A 50 Hz, 11 kV, three phase alternator with earthed neutral has a reactance of 5 ohm/phase and is connected to the bus-bar through a circuit breaker. The capacitance to earth between the alternator and the circuit breaker is 0.02 microfarad per phase. Assume the resistance of the generator to be negligible. Calculate the following.

   (a) Maximum value of voltage across the contacts of the circuit breaker

   (b) Frequency of oscillation

   (c) The average rate of rise of restriking voltage up to first peak [6+4+6]

4. Explain resistance switching in detail with relevant diagrams and derive the expression of damped oscillation. [4+8+4]

5. (a) What is meant by directional feature of a directional over current relay? Describe the construction, principle of operation and application of a directional over current relay. [2+2+2+2]

   (b) What is the difference between a polarized mho and simple mho relay. What are self-polarized and cross-polarized mho relays? [4+4]

6. (a) Explain the merits and demerits of static relays.

   (b) Discuss how an amplitude comparator can be converted into a phase comparator and vice versa. [8+8]

7. (a) Discuss the protection employed against loss of excitation of alternator.

   (b) Discuss any one of the stator protection schemes for generators above 1MW. [8+8]

8. (a) Discuss the choice between impedance, reactance and Mho type relays. [2+2+2+2]

(b) Transformer: 5 MVA, Y / Δ, X=6%

The transmission line sections AB and BC are to be protected by Mho distance relays. The system is as shown in the figure8b. If the C.T. ratio is 300/5 and C.T. ratio is 166000/110V and a 3-∅ short circuit fault of zero impedance occurs at F, find the impedance seen by the relays and determine the setting of the relays for high speed protection of line AB and backup protection for line BC, when the relays are located at end A. [8]
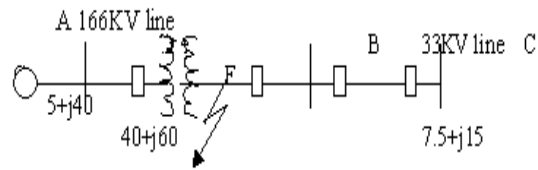

Figure 8b

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