Code No: V3210 **R07** **Set No: 1**

III B.Tech. II Semester Supplementary Examinations, December - 2012

SWITCH GEAR AND PROTECTION

(Electrical and Electronics Engineering)

Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

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1. (a) Discuss the reasons for arc formation in circuit breakers and enlist the methods of arc extinction.
   (b) A 50Hz, 11kV generator is connected to a power system. The system inductance and capacitance per phase are 10 mH and 0.02 μF respectively Calculate (i) the maximum voltage across the contacts of the CB at an instant when it posses through zero, (ii) frequency of transient oscillation and (iii) average rate of rise of voltage up to the first peak of oscillation. Neglect resistance.

2. Explain the process of arc extinction in an oil circuit breaker. Draw the neat sketch of an oil circuit breaker and describe its working.

3. (a) Drive the general equation of an electro-magnetic relay at the threshold of operation and show its characteristic on the complex plane
   (b) What is the principle of a differential relay? What are its draw backs and how are they overcome? Explain.

4. What are the abnormal conditions in a large alternation against which protection is necessary? Discuss them briefly.

5. (a) Discuss the special factors that are to be considered while designing the protection scheme for a large star-delta power transformer.
   (b) A.3-phase delta-star connected 30MVA,33/11KV transformer is protected by a simple differential relaying scheme. The CT ratio on the Primary side is 500/5 A and that on secondary side is 2000/5←A. Sketch the CT connection diagram for the relaying scheme. Also calculate the relay setting for fault drawing up to 200% of rated current.

6. (a) Explain in details carries current protection scheme. Describe carrier phase comparison relay with neat sketches.
   (b) Describe the trip circuit diagram of 3-zone distance relay used for the protection of line, why 3-zones are necessary.

7. (a) Discuss the advantages of grounding the neutral of a system.
   (b) Explain the phenomenon of arcing ground and suggest some method to minimize the effect of this phenomenon.

8. (a) What are the causes of over voltage in power systems? Discuss. Bring out the functions of ground wire in transmission lines.
   (b) Describe the construction and explain the operation of thirties type lightning arrester

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Code No: V3210 **R07** **Set No: 2**

III B.Tech. II Semester Supplementary Examinations, December - 2012

SWITCH GEAR AND PROTECTION

(Electrical and Electronics Engineering)

Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

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1. (a) Explain the factors which influence the arc voltage.
   (b) A 50Hz,3-Phase alternator with grounded neutral has an inductance of 1.6mH per phase and is connected to the bus – bars through a circuit breaker. The capacitance to earth of the circuit between the alternator and the CB is 0.0032 μF per phase. Due to a short on the bus-bar the breaker opens when the r m s value of the current is 8000A. Determine the following
   (i) Frequency of oscillations (ii) active recovers voltage (iii) Time for maximum RRR V and (iv) maximum.RRR V

2. What are the merits and problems associated with the use of SF_6 in a circuit breaker. Describe the construction and working of an SF_6 circuit breaker with multiple-breaks.

3. (a) Describe the differences between definite characteristics and inverse characteristics of relays.
   (b) What is universal torque equation? Using this equation derive the following characteristics (i) impedance relay, (ii) reactance relay and (iii) mho relay

4. (a) What are the rotor faults in an alternator? For such fault give their causes and suggest protective measures.
   (b) A 6.6 kV,10 MVA star connected alternator has a reactance of 2 ohms per phase and winding. And negligible resistance. Merz-price protection is used for protection of winding. The neutral grounding resistance is 5 ohms. If only 10% of the winding is to remain unprotected, determine the setting of the relay.

5. (a) Explain with a neat circuit diagram the differential protection scheme used to protect star-delta transformers.
   (b) Describe with a sketch the operation of Buchholz relay.

6. (a) Discuss in detail the protection of parallel feeder and ring mains.
   (b) Explain the differential bus bar protection. What are the imitations of this protection scheme and to what extant these can be overcome

7. (a) Explain the reasons leading to the general practice of earthling the neutral point of a power system and discuss the relative merits of earthling it (i) solidly and (ii) through a resistance.
   (b) A33kV,3-Phase, 50 Hz overhead line 60km long has a capacitance to ground of each line equal to 0.015 μF per km. Determine the inductance and kVA rating of the Peterson coil.

8. (a) Explain the valve type lightning arrestor with neat diagram.
   (b) Discuss the basic impulse insulation level? What is the significance of BIL

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Code No: V3210 **R07** **Set No: 3**

III B.Tech. II Semester Supplementary Examinations, December - 2012

SWITCH GEAR AND PROTECTION

(Electrical and Electronics Engineering)

Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

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1. (a) Explain the various methods of arc extinction in circuit breaker.
   (b) in a short circuit test on a circuit breaker, the following data was obtained on a frequency transient.
   (i) time to reach the peak restriking voltage 55μsec
   (ii) the peak restriking voltage 100kV
   Determine the natural frequency of the circuit and average rate of restriking voltage.

2. With a neat sketch explain the principle of operation of air break circuit breaker. Why an arc Cute and blow out coil are used in a circuit breaker. Explain briefly why is it easier to break current in an arc circuit breaker them a d c circuit breaker?

3. Explain the functions of a protective relay in a power system. Discuss the principal features of a good protective relay. Draw and explain the principle of operation of an induction type over current relay.

4. (a) Make a list of faults, which may occur an alternator. State the protections to be used for each of such fault.
   (b) Describe with a neat sketch the percentage differential protection of modern alternator.

5. (a) What is the principle of harmonic restraint relay? Explain its application.
   (b) A 50mVA, 132/33kV, delta/star, 3-Phase power transformer is protected by percentage differential relays. If the current transformers located on delta and star sides of the power transformer are 300/5A and 1200/5A respectively, determine
   (i) the output current at full load, (ii) the relay current at full load and (iii) the minimum current relay setting to permit 25% overload.

6. (a) Explain over current protection of feeders. How is the protection system graded with respect to the time of operation for relays for a radial feeder.
   (b) What is the necessity of bus-bar protection?

7. (a) Explain the function of Peterson coil and how it helps in reducing arcing grounds
   (b) Describe the neutral grounding practice

8. (a) Explain the Zinc-oxide lightning arrester with neat diagram.
   (b) Describe the construction of voltage characteristic.

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Code No: V3210 **R07** **Set No: 4**

III B.Tech. II Semester Supplementary Examinations, December - 2012

SWITCH GEAR AND PROTECTION

(Electrical and Electronics Engineering)

Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

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1. (a) Explain the factors affecting restriking voltage characteristics.
   (b) In a short circuit test on a 3-pole,132kV CB, the following observations are made: P.f of fault 0.4, the recovery voltage 0.9 times full line value the breaking current symmetrical, the frequency of oscillation of restriking voltage 16 kHz. Assume that the neutral is grounded and the fault does not involue ground, determine the average neat of rise of restriking voltage.

2. Describe the working principle of a vacuum circuit breaker. How contact moment and electrical connections with the contacts are made in a vacuum circuit breaker? What are the short comings of a vacuum circuit breaker

3. (a) Explain the principle of operation of IDMT relay. How is the directional characteristic introduced?
   (b) Compare the state relays over electromagnetic relays

4. (a) Describe protection scheme of a alternator against interation fault
   (b) A 13.8 kV,125 MVA, star connected alternator has a synchronous reactance of 1.4 p.u per phase and a negligible resistance. It is protected by a merz-price balanced current system which operates when out of balance current exceeds 10% of full load current. If the neutral point is earthed through a resistance of 2Ω, determine what proportion of winding is protected against earth fault.

5. Explain the protection for transformer by using merz-price system of protection with the help of neat diagram. How many faults develop in a power transformer.

6. (a) Describe a suitable protection system for a ring main formed by a power station and four substations and explain, learly its working when a fault occurs
   (b) Explain the directional comparison method of carries current protection.

7. (a) What are the different types of grounding? Explain reactance grounding.
   (b) Explain as to why the neutral point of a power system earthed Discuss the relative merits of earthing the neutral point through Peterson coil. Draw the phase diagram and device the equation for the value of inductance.

8. (a) State the various causes of over voltages in a power system? Name the various devices used for protection against over voltage due to lightning.
   (b) Why is insulation co ordination required in a large power system? What is meant by BIL of equipment?

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