USN | | | | | | | | | | |

NEW SCHEME

Sixth Semester B.E. Degree Examination, July 2006
Electrical and Electronics Engineering
Switchgear and Protection

Time: 3 hrs.] [Max. Marks:100

Note: *1. Answer any FIVE questions.*

1 a. Derive expressions for restriking voltage and RRRV in terms of system voltage, inductance voltage and capacitance. **(08 Marks)**

b. For a 132 kV system, the reactance and capacitance up to the location of the circuit breaker are 3 Ω and 0.015 μF respectively. Calculate the following :
   i) The frequency of transient oscillation,
   ii) The maximum value of the restriking voltage across the contacts of the circuit breaker,
   iii) The maximum value of RRRV. **(06 Marks)**

c. Explain the phenomenon of current chopping in a circuit breaker. **(06 Marks)**

2 a. With a neat sketch describe the working principle of an axial air blast type circuit breaker. **(10 Marks)**

b. Describe the working principle of SF_6 circuit breaker. What are its advantages over other types of circuit breakers? For what voltage range is it recommended? **(10 Marks)**

3 a. Explain the following with reference to circuit breakers :
   i) Breaking capacity ii) Making capacity iii) Short-time capacity. **(07 Marks)**

b. With a neat sketch describe the working principle of a liquid fuse. **(07 Marks)**

c. What do you mean by discrimination? Discuss discrimination between
   i) two fuses and ii) a fuse and a over current relay. **(06 Marks)**

4 a. The current ratings of an over current relay is 5A. It has a PSM = 2, TSM = 0.3, C.T. ratio = 400/5, Fault current = 4000 A. Determine the time of operation of the relay assuming normal IDMT characteristics. **(04 Marks)**

b. Explain time graded and current graded system for a feeder. **(08 Marks)**

c. With a neat sketch explain the principle of operation of a non-directional over current relay. **(08 Marks)**

5 a. Explain the principle of working and operating characteristics of a percentage biased differential relay. **(10 Marks)**

b. Explain differential scheme of bus bar protection. What can be drawbacks of this scheme and how this can be overcome? **(10 Marks)**

6 a. Explain the working principle and characteristics of an impedance relay. **(06 Marks)**

b. Describe the three-zone distance protection of transmission lines. **(08 Marks)**

c. Explain the principle of DC arc extinction in circuit breaker. **(06 Marks)**

7 a. List the various abnormal operating conditions against which a modern large turbo-alternator has to be protected. **(06 Marks)**

b. Draw the connection diagram showing differential protection, negative sequence protection, over-current protection and earth fault protection of a Y-connected generator. **(08 Marks)**

c. List the various abnormal operating conditions against which a large induction motor has to be protected. **(06 Marks)**

8 a. Explain the working of Buchholz relay. **(08 Marks)**

b. Describe the harmonic restraint relay used to protect transformers. **(08 Marks)**

c. A 3-phase transformer rated for 33 KV/6.6 KV is connected star/delta and the protecting current transformer on the low voltage side have a ratio of 400/5. Determine the ratio of the CT on the HV side. **(04 Marks)**

*****