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Sixth Semester B.E. Degree Examination, May/June 2010
Switchgear and Protection

Time: 3 hrs.

Max. Marks:100

**Note: Answer any FIVE full questions, selecting
at least TWO questions from each part.**

PART – A

1.
 - a. Explain the cut – off characteristics and time-current characteristics of a fuse. (06 Marks)
 - b. With a neat sketch, explain the construction and working of a high voltage liquid type fuse. (06 Marks)
 - c. Discuss the recovery rate theory and energy balance theory of arc interruption in a.c. circuit breaker. (08 Marks)
2.
 - a. Explain the phenomenon of current chopping in a circuit breaker. (06 Marks)
 - b. What is resistance switching? Derive the expression for critical resistance interns of system inductance and capacitance, which gives no transient oscillation. (08 Marks)
 - c. In a 132 kV system, reactance and capacitance up to the location of the circuit breaker are 5Ω and $0.02 \mu\text{F}$ respectively. A resistance of 500Ω is connected across the circuit breaker. Determine : i) Natural frequency of oscillation ; ii) Damped frequency of oscillation and iii) Critical value of resistance. (06 Marks)
3.
 - a. With a neat figure, explain the construction and working of an axial flow air – blast circuit breaker. (08 Marks)
 - b. Discuss, resistance switching in air – blast circuit breaker. (06 Marks)
 - c. Explain the following terms with respect to SF_6 gas i) Electronegativity and ii) Arc time constant. (06 Marks)
4.
 - a. With a neat figure, explain the construction of an outdoor minimum – oil circuit – breaker. (06 Marks)
 - b. Discuss, direct testing of a circuit breaker. (08 Marks)
 - c. With a circuit diagram and waveform, explain synthetic testing an HV circuit breaker. (06 Marks)

PART – B

5.
 - a. What is a protective relay? Discuss the basic requirements of protective relaying. (08 Marks)
 - b. Explain concept of zones of protection used in protection of large power systems. (06 Marks)
 - c. Differentiate between IDMT overcurrent relay and extremely inverse – time overcurrent relay characteristics. (06 Marks)
6.
 - a. Explain the construction and working of a Buchholz relay. (06 Marks)
 - b. Determine the actual time of operation of a 5 ampere, 3 second over current relay having a current setting of 125% and a time setting multiplier of 0.6 connected to supply circuit through a 400/5 current transformer when the circuit carries a fault current of 4000 A. Time of operation is 3.5 seconds for the estimated value of PSM. (06 Marks)
 - c. Explain stepped time-distance characteristics of three distance relaying units used for I, II and III zones of protection. (08 Marks)
7.
 - a. With the basic circuit diagram, explain harmonic restraint relay protection for a transformer. (10 Marks)
 - b. Describe the loss of excitation protection in a generator and its characteristics. (10 Marks)
8. Write short notes on :
 - a. Microprocessor based overcurrent relay
 - b. Vacuum circuit breaker
 - c. Restricted earth – fault protection in a transformer
 - d. Fuse and fuse materials. (20 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that proper record-keeping is essential for transparency and accountability, particularly in the context of public administration and government operations. The text highlights that without reliable records, it becomes difficult to track the flow of funds, assess performance, and identify areas for improvement.

2. The second part of the document focuses on the role of technology in enhancing record-keeping and data management. It notes that modern digital tools and software solutions can significantly reduce the risk of human error and improve the efficiency of data collection and storage. The text suggests that investing in technology is a key strategy for organizations looking to optimize their record-keeping processes and ensure the long-term integrity of their data.

3. The third part of the document addresses the challenges associated with data security and privacy. It acknowledges that as organizations collect and store more data, they also face an increasing risk of cyber threats and data breaches. The text stresses the importance of implementing robust security measures, such as encryption and access controls, to protect sensitive information and maintain the trust of stakeholders.

4. The fourth part of the document discusses the importance of regular audits and reviews of record-keeping systems. It explains that periodic audits help to identify any discrepancies, errors, or areas of non-compliance with relevant regulations and standards. The text recommends that organizations should establish a clear audit schedule and involve independent auditors to ensure the objectivity and reliability of the findings.

5. The fifth part of the document concludes by emphasizing the overall benefits of a well-implemented record-keeping system. It states that such a system not only ensures the accuracy and security of data but also provides valuable insights into organizational performance and trends. The text encourages organizations to view record-keeping as a strategic investment that can lead to improved decision-making and operational efficiency.