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10EE62

Sixth Semester B.E. Degree Examination, June/July 2019

Switch Gear 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 with a neat sketch, the construction and working of a HRC fuse. Also explain its properties and characteristics. (08 Marks)
- b. Discuss the Recovery Rate Theory and Energy balance theory of ARC interruption in a circuit Breaker. (08 Marks)
- c. Explain the difference between isolating switch and load break switch. (04 Marks)
- 2 a. Derive an expression for Restriking Voltage and Rate of Rise of Restriking Voltage (RRRV). (07 Marks)
- b. A 50 Hz generator has an emf to neutral is 7.5 KV (rms). The reactance of the generator and the connected system is 4Ω and the distributed capacitance to neutral is $0.01 \mu\text{F}$ with negligible resistance:
 - i) Maximum voltage across the circuit breaker contacts
 - ii) Frequency of oscillation
 - iii) RRRV average up to first peak of oscillations. (06 Marks)
- c. Explain the phenomenon of current chopping and capacitive current in the circuit breaker. (07 Marks)
- 3 a. Explain the construction and working of minimum oil circuit breaker. (07 Marks)
- b. Explain the working of Air Break Circuit breaker. (06 Marks)
- c. With a neat sketch explain the construction and working of Puffer type SF_6 Breaker. (07 Marks)
- 4 a. Explain the construction, working, advantages and disadvantages of vacuum circuit breakers. (08 Marks)
- b. Write explanatory note on:
 - i) Direct testing of CB
 - ii) Synthetic testing
 - iii) Rating of circuit breaker (12 Marks)

PART – B

- 5 a. What do you mean by Protective Relaying? Discuss the desirable requirements of Protective Relaying. (08 Marks)
- b. With a neat sketch, explain the construction and working of directional over current relay. (12 Marks)
- 6 a. Derive an expression for the torque produced by an Induction type relay. (06 Marks)
- b. Explain with neat sketch the working of Buchholz's relay. (06 Marks)
- c. Explain with a neat sketch, the construction and operating characteristics of percentage differential relay protection. (08 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.

- 7 a. Draw and explain the Merz-Price Protection of Star and Delta connected Alternator Stator windings. State its advantages. (10 Marks)
- b. Discuss the important Faults on Alternator. (04 Marks)
- c. A 5000 KVA, 6.6 KV, Star connected alternator has $X_S = 2 \Omega$ per phase and 0.5Ω resistance. It is protected by Merz-Price balanced current system which operates when the out of balance current exceeds 30% of the load current. Determine what proportion of alternator winding is unprotected if the star point is earthed through a resistor of 6.5Ω ? (06 Marks)
- 8 a. Explain with block diagram of a microprocessor based over current relay. (06 Marks)
- b. Explain with circuit, Restricted Earth-Fault protection in a transformer. (06 Marks)
- c. What do you mean by phase fault and ground fault in 3 phase induction motor? How the motors are protected against such faults? (08 Marks)

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