

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VII (NEW) EXAMINATION – WINTER 2018

Subject Code: 2170908

Date: 19/11/2018

Subject Name: Switch Gear and Protection

Time: 10:30 AM TO 01:00 PM

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

MARKS

- Q.1**
- (a) Explain the following requirements of protection system. **03**
 (i) Selectivity (ii) Reliability (iii) Security
- (b) Discuss time and current grading schemes of over current protection. **04**
- (c) Discuss the working principle of an induction relay and also derive an expression for the torque produced by it. **07**

- Q.2**
- (a) Clearly distinguish the terms “Overload” and “Overcurrent”. **03**
- (b) Explain, what are the basic requirements of a protective System. **04**
- (c) Compare following **07**
 (i) Measuring CT and Protection CT
 (ii) Electromagnetic type PT and Capacitor type PT

OR

- (c) Define the terms ‘Plug Setting Multiplier’ and ‘Time Multiplier Setting’ used in context of an IDMT relay. An IDMT type overcurrent relay is used to protect a feeder through a 500/1A CT. The relay has a plug setting of 125% and TMS=0.3. Find the time of operation of the said relay if a fault current of 5000A flows through the feeder. Make use of the following characteristics:

PSM	2	3	5	8	10	15
Time for TMS=1	10	6	4.5	3.2	3	2.5

- Q.3**
- (a) What problems, if any, do you anticipate in applying conventional differential protection to a transmission line? **03**
- (b) What are the limitations found in the simple differential protection of a transformer? How are they overcome? **04**
- (c) With the help of schematic diagram, discuss various components of digital/numerical relays. **07**

OR

- Q.3**
- (a) What are the conditions which lead to incipient faults in transformer? What type of protection is required? **03**
- (b) What are advantages of numerical relays? **04**
- (c) Draw a detailed protection scheme for biased differential Protection of a 11/66KV, 45 MVA, DY power transformer. Suggest suitable CT ratios. What is minimum recommended percentage bias? **07**

- Q.4**
- (a) Compare minimum oil CB and bulk oil CB. **03**

(b) Explain the need for a three stepped distance protection of a transmission line. **04**

(c) Explain power line carrier current protection by direction comparison showing schematic connection dia. of equipments used in it. **07**

OR

Q.4 (a) What are the advantages of power line carrier? **03**

(b) Explain Following with reference to Circuit Breaker:
(a) Breaking Current (b) Making Current **04**

(c) Write short note on SF6 circuit breaker. **07**

Q.5 (a) Explain the effect of natural frequency on TRV. **03**

(b) Explain the physics of arc phenomena. On what factors does the arc phenomenon depends? **04**

(c) What is meant by loss of excitation in a generator? What protection is used against it? **07**

OR

Q.5 (a) Explain reactance relay with characteristics. **03**

(b) An air- blast CB designed to interrupt a transformer magnetizing current of 15A (rms) chops the current at an instantaneous value of 12A. The value of L and C in the circuit are 8H and 0.009 μ F. Find the voltage that appears across the circuit breaker. Assume that the inductive energy is transformed to capacitance. **04**

(c) List and explain various protections used for an induction motor. **07**

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