Seat No: _____ **Enrollment No: _____**

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

B.Tech. Summer 2021 - 22 Examination

Semester: 8 **Date: 28-03-2022**

Subject Code: 03106452 **Time: 10:30 am to 01; 00 pm**

Subject Name: Power System Protection **Total Marks: 60**

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 Objective Type Questions (All are compulsory) (Each of one mark) **(15)**

1. The magnitude of the generator earth fault current is limited by
   a) inserting stabilizing resistance in series with the relay
   b) using higher rating CTs
   c) controlling field exciter
   d) inserting suitable resistance in neutral grounding circuit
2. What should always be the value of fusing factor?
   a) May be greater or less than unity depending on rated current
   b) Equal to unity
   c) Less than unity
   d) More than unity
3. Which of the following protections is not applied to small induction motors?
   a) Differential protection
   b) Overcurrent protection
   c) Short circuit protection
   d) Thermal overload protection
4. The purpose of the restraining coil in a biased differential relay is
   a) to reduce CT saturation during fault
   b) to increase the sensitivity of the relay
   c) to match the transformation ratio
   d) to limit the spill current through the relay during heavy external fault
5. According to sampling theorem, in order to preserve the information contained in a signal of frequency ωsignal, it must be sampled at
   a) frequency at least equal to or less than twice the signal frequency
   b) frequency at least equal to or greater than twice the signal frequency
   c) frequency greater than twice the signal frequency
   d) none of these
6. Buchholz relay is most essential for protection against _____ fault.
7. Actual rms current flowing in the relay expressed as a multiple of the setting current or pickup current is known as _____.
8. The reverse power protection is necessary when the prime mover is _____ turbine.
9. The operating principle of differential current protection of busbar is based on _____ law.
10. For a single circuit one terminal transmission line (three conductors), _____ distance units are required.
11. The operating time of definite minimum time relay is _____ of current magnitude. (dependent / independent)
12. The current at which the fuse element melts is called _____.
13. In case of induction motor, purpose of thermal overload protection is to protect _____ from excessive thermal stresses.
14. As per IEEE Standard C37.2-1996, device number for differential protective relay is _____.
15. Switching of unloaded transformer during zero crossing of a voltage wave generates _____.

Q.2 Answer the following questions (Attempt any three) **(15)**

A) Determine the time of operation of a 1 A, 3 s overcurrent relay having plug setting of 125 percent and a time multiplier of 0.6. The supplying CT is rated 400:1 A and fault current is 4000 A. The relay characteristic curve is given below:

PSM	1.3	2	4	8	10	20
Time of Operation (in Seconds)	30	10	5	3.3	3	2.2

B) Explain about Current Graded and Time Graded Overcurrent Protection provided to Radial Feeder System.

C) Discuss various zones of protection for a modern power system.

D) Draw detail figure of percentage differential protection provided to Δ-Y connected power transformer. Mention any two disadvantages of simple differential protection which are solved by percentage differential protection.

Q.3 A) Discuss Overvoltage and Overspeed protections provided to Alternator. **(07)**

B) Explain in detail about protections provided to Induction Motor against Overloading and Single Phasing. **(08)**

OR

B) Explain in detail about selection of Current Transformers for Bus Zone Protection. **(08)**

Q.4 A) 11 kV, 100 MVA alternator is provided with differential protection. The percentage of winding to be protected against phase to ground fault is 85%. The relay is set to operate when there is 20% out of balance current. Determine the value of the resistance to be placed in the neutral to ground connection. **(07)**

OR

A) A 3-phase, 33000/6600 V transformer is connected in star/delta and the protecting current transformer on the low voltage side have a ratio of 300/5 A. What will be the ratio of the current transformer on the high voltage side? **(07)**

B) With the help of a schematic diagram, explain about numerical/digital relay. Discuss about any one component of numerical/digital relay in detail. **(08)**