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Code No. : 32213

**VASAVI COLLEGE OF ENGINEERING (Autonomous), HYDERABAD**  
**B.E. (E.E.E.) III Year II-Semester Main Examinations, May-2017**

**Switchgear and Protection**

Time: 3 hours

Max. Marks: 70

*Note: Answer ALL questions in Part-A and any FIVE from Part-B*

**Part-A (10 × 2 = 20 Marks)**

1. What are the essential qualities of protective system?
2. Mention the advantages and disadvantages of electromagnetic relays.
3. What are the limitations of static relay?
4. Draw the block diagram of microprocessor based over current relay.
5. Differentiate between bias coil and relay coil in percentage differential protection.
6. Why the percentage differential protection does not respond to external faults and overloads?
7. Define symmetrical and asymmetrical breaking currents in circuit breaker.
8. What are the advantages and disadvantages of SF<sub>6</sub> circuit breaker?
9. How Tower footing resistance is reduced?
10. Define the impulse ratio of lightning arresters.

**Part-B (5 × 10 = 50 Marks)**

*(All bits carry equal marks)*

11. a) The current rating of a relay is 5A. PSM = 2, TMS = 0.3, C.T. ratio is 400/5. Fault current = 4000A. Determine the operating time of the relay at TMS = 1; operating time at various PSM are

PSM	2	4	5	8	10	20
Operating time in Seconds	10	5	4	3	2.8	2.4

- b) Discuss about over current protection for ring main system.
12. With a neat sketch explain the operating principle of
  - a) Phase splitting type amplitude comparator.
  - b) Draw the schematic diagram of a numerical relay and briefly describe the functions of its various components.
13. a) Explain the effect of inrush magnetizing current on the protective system of transformers.
  - b) Calculate the required value of neutral resistance for a three phase 11 kV alternator, so as to protect 70% of the winding against earth fault by a relay with pickup current of 1A. The neutral CT has a ratio of 250/5.

14. a) An 11 kV, 50 Hz alternator is connected to a system which has L and C per phase of 10 mH and 0.01  $\mu$ F respectively. Determine *i)* maximum voltage across the breaker contacts; *ii)* frequency of transient oscillation; *iii)* the average RRRV; *iv)* the maximum RRV.
- b) With a neat sketch explain the principles of operation of SF<sub>6</sub> circuit breaker. For what range of voltages SF<sub>6</sub> is used?
15. a) Explain the terms protective ratio, protective angle and protective zone with respect to ground wire.
- b) What is the significance of Insulation coordination in power system?
16. a) Explain about current-graded protection scheme.
- b) Derive the characteristics of impedance, reactance and Mho relay from Universal Torque equation.
17. Answer any *two* of the following:
- a) Explain the principle operation of Ferranti surge absorber
- b) Explain the process of Current chopping in EHV circuit breaker
- c) How the Power transformer is protected with gas actuated relay.

