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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

Eighth Semester, B.E. - Electrical and Electronics Engineering

Semester End Examination; June/July - 2015

Modern Power System Protection

Time: 3 hrs

Max. Marks: 100

Note: i) Answer any **FIVE** full questions selecting at least **TWO** full questions from each **part**.
ii) Any missing data may be suitably assumed

PART - A

1. a. What are the advantages of static Relays? Explain the basic construction of a static relay using a Block diagram and clearly identify the blocks. 10
- b. Describe the use of following components in a static relay: 10
 - i) Transistor as a Switch
 - ii) Thyristor
 - iii) FET as a Switch.
- 2 a. What is i) Amplitude Comparison 10
ii) Phase Comparison
Describe a Phase splitting type Amplitude comparator.
- b. Explain Duality principle between Amplitude and Phase comparators using Vector diagrams. 10
- 3 a. Derive the general equation for an amplitude comparator. How do you get impedance characteristics from the equation? 10
- b. List out the types of Phase comparators. Explain a coincident type phase comparator using Zener Diodes. 10
- 4 a. Discuss in detail the advantages of numerical Relays. 10
- b. With a clear block diagram, explain the features of a typical numerical relay. 10

PART - B

- 5 a. Describe the functions of a static inverse time over current relay with a block diagram. What are the three main IDMT over current characteristics used in practice? 10
- b. Explain a combined single phase under voltage and over voltage relay with a block diagram. 10
6. a What are distance relays? With diagrams explain a directional three zone stepped impedance distance protection for a radial transmission line. 10
- b. A section of a power system is shown in Fig. Q.6(b). Relays R_1 and R_2 are MHO Relays with 60° as characteristic angle. The secondary OHMS in the three zones of both relays are $K_1 = 9.64 \Omega$, $K_2 = 26 \Omega$ and $K_3 = 40 \Omega$. Calculate the reach of relay R_1 in all the three zones. 10

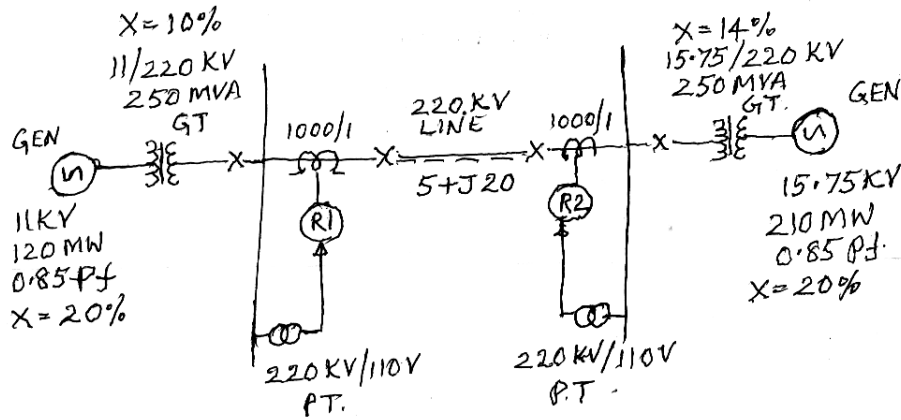


FIG Q6(b)

- 7 a. List the types of distance Relays. Describe a three ZONE off-set MHO RELAY for a radial transmission line. 10
- b. With a block diagram, describe the functions of a micro processor based over current relay. 10
- 8 a. Explain a microprocessor based directional over current relay with a block diagram. 10
- b. Explain how a ring main system is protected using non-directional and directional over current relays with suitable diagrams. 10

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