

BENGAL ENGINEERING AND SCIENCE UNIVERSITY, SHIBPUR

B.E. (EE) 8th Semester Final Examination 2012

Subject: Switchgear and Protective Relaying

Paper / Code No: EE – 802

Branch: Electrical Engineering

Time: 3 Hours

Full Marks: 70

(i) Answer any SIX questions taking THREE from each half

(ii) TWO marks are reserved for neatness in each half

FIRST HALF

- 1.(a) Justify the use of Numerical relay in view of the essential qualities of relay.
(b) Explain the operation of Anti-Pumping scheme. State its purpose and exact area of application. [5+6]
- 2.(a) State the origin of earth fault. Why is an additional neutral impedance added? When an arcing ground occurs? Draw a scheme to protect a line against an earth fault and over current condition. [2+1+1+2]
(b) Name different types of over current relays with their characteristics and curve. State also their application. [5]
- 3.(a) Name different types of protection used for protecting a power transformer. Explain with connection diagram, Restricted Earth fault protection of Power transform. [3+3]
(b) State the effect of over fluxing on transformer and suggest the protection of transformer against over fluxing. [2.5+2.5]
- 4.(a) State the process involved in digital protection. State with the help of block diagram, process involve in signal conditioning. [3+3]
(b) Obtain the theory of Two- input comparator. State the theory of Two – input co-incidence comparator. [3+2]
- 5.(a) Show that a bi-metal overload relay can be used as single phasing preventer. [5]
(b) Give a complete scheme of protection of H.T induction motor. Draw the relay co-ordination curves. Explain the protection against single phasing. [2+2+2]

SECOND HALF

- 6.(a) Derive the characteristic equation of a percentage differential relay and draw its characteristic curve. [5]
(b) Explain how does a percentage differential relay overcome the drawbacks of a simple differential relay. [3]
(c) How do you adjust the slope of a percentage differential relay? [1]
(d) Higher slopes are required in a case where there is a lot of mismatch between the CTs at the two ends. Explain. [2]

- 7.(a) Can a generator be allowed to run when its excitation is lost? Justify your answer. [6]
- (b) Why is loss of excitation difficult to detect by monitoring the field current? [1]
- (c) Suggest a protective system to detect loss of excitation. [4]
- 8.(a) What are the probable causes of unbalanced current flow through the stator windings? [2]
- (b) What are the possible ill effects of unbalanced current flow? [3]
- (c) Suggest a protective system to detect a severe unbalanced condition and to provide necessary remedial actions. [3]
- (d) Can a generator be allowed to run when its prime mover is lost? Justify your answer. [3]
- 9.(a) What is the basic principle of distance relaying? How do under reach and over reach affect the performance of distance relays? [6]
- (b) A simple reactance type distance relay is used to protect a line having resistance and reactance of 0.2 and 2.0 ohm per km respectively. The distributed capacitance of the line may be neglected.
The reflected critical reactance of the relay is set at 50 ohm.
- (i) Calculate the length of the line protected by this unit. [1]
- (ii) If the line is compensated by a series capacitor of 20 ohm placed at the middle, calculate what length of the line will be protected? [2]
- (iii) Assuming that an arcing short circuit having an impedance of impedance of $(2 + j0)$ ohm can occur any where along the line section, find the maximum length that can be protected by this unit. [2]
- 10.(a) What are the advantages of Carrier Aided Distance Protection over ordinary Distance Protection? [3]
- (b) Explain the principle of operation of Carrier Transfer type of Carrier Aided Distance Protection. [8]