

Switchgear and Protection (315334)

MSBTE Diploma · K-Scheme · Model Question Paper — Set B

Time: 3 Hours**Max. Marks: 70****Instructions:**

1. All questions are compulsory.
2. Answer each next main question on a new page.
3. Illustrate your answers with neat sketches wherever necessary.
4. Figures to the right indicate full marks.
5. Assume suitable data, if necessary.
6. Use of non-programmable electronic pocket calculator is permissible.
7. Mobile phone, pager and any other electronic communication devices are not permissible in the examination hall.

Q.1 Attempt any FIVE of the following:**10**

- a) State any four components of a protective system.
- b) Define the following terms related to HRC fuse: i) Pre-arcing time ii) Cut-off current.
- c) Explain the terms selectivity and reliability of a protective relay.
- d) Define: i) Pick-up current ii) Reset (drop-off) current of a relay.
- e) State any two limitations of static relays.
- f) List any four faults (abnormal conditions) in a power transformer.
- g) State any two differences between MCB and MCCB.

Q.2 Attempt any THREE of the following:**12**

- a) State the need of current limiting reactors. Draw the ring system and tie-bar system of bus-bar reactors.
- b) With the help of waveforms explain: arc voltage, restriking voltage, recovery voltage and RRRV.
- c) Explain the construction of HRC cartridge fuse with a neat sketch. State any two advantages.
- d) Explain the principle of impedance (distance) relay with a neat diagram.

Q.3 Attempt any THREE of the following:**12**

- a) Two 3-phase, 11 kV generators rated 10 MVA (12 % reactance) and 15 MVA (15 % reactance) operate in parallel. They supply a transmission line through a 25 MVA, 11/33 kV transformer of 6 % reactance. Calculate the fault MVA and the fault current for a symmetrical 3-phase fault on the HV side of the transformer.
- b) Compare isolator, fuse and circuit breaker (any four points).
- c) What is back-up protection? Explain relay back-up and remote back-up with a suitable diagram.

- d) Explain the construction and working of thermal (bimetallic) overload relay with a neat sketch.

Q.4 Attempt any THREE of the following:

12

- a) An IDMT over-current relay rated 5 A has a current setting of 100 % and is connected to a CT of ratio 500/5. For a fault current of 5000 A calculate: i) operating time of the relay if TMS = 0.3, ii) TMS required to give an operating time of 1.2 s.

Time/PSM curve of the relay (TMS = 1):

PSM	2	3	4	5	6	8	10	12	15	20
Time (s)	10.03	6.30	4.98	4.28	3.84	3.30	2.97	2.75	2.52	2.27

- b) Explain the construction and operation of Buchholz relay with a neat labelled sketch.
- c) Explain the differential (circulating current) protection of bus-bars with a neat diagram.
- d) State the causes and effects of single phasing in a 3-phase induction motor. How is the motor protected against it?
- e) State the specifications of CT and PT used for protection purpose.

Q.5 Attempt any TWO of the following:

12

- a) Draw a neat sketch of vacuum circuit breaker and explain its working. State its advantages and applications.
- b) Explain the working of microprocessor based IDMT over-current relay with a neat flow chart.
- c) Explain Merz-Price differential protection of a power transformer. State the difficulties faced in this scheme and how they are overcome.

Q.6 Attempt any TWO of the following:

12

- a) i) State any four factors to be considered for selection of a circuit breaker. ii) What is a Ring Main Unit (RMU)? Classify RMUs.
- b) State the need of a directional relay. Explain its operation with a block diagram.
- c) Explain circulating current pilot-wire protection of a transmission line with a neat diagram. State any four limitations of the scheme.

Note: This is a **model question paper prepared by Ananda Technologies** only for practice and exam preparation, based on the pattern of previous MSBTE question papers and the K-scheme syllabus. It is **not an official MSBTE paper**, and it does **not** mean that these questions will come in the exam. Answers follow standard textbook points; marks shown are indicative. Free for students — anandatechnologies.in