Model Question Paper-I with effect from 2018-19

USN ⬜⬜⬜⬜⬜⬜⬜⬜⬜⬜   **15EE72**

Seventh Semester B.E.(CBCS) Examination
Power System Protection
(Core subject, E&EE)

Time: 3 Hrs   Max.Marks: 80

Note: Answer any FIVE full questions, choosing at least ONE question from each module.

Module-1

1. **(a)** List and explain the essential qualities of a protective relay. **(06 Marks)**
  (b) Derive an expression for torque produced by an induction relay. **(05 Marks)**
  (c) What are the advantages of static relays over electromechanical relays? **(05 Marks)**

OR

2. **(a)** With a neat sketch, explain the operating principle of a rectifier bridge amplitude type comparator. **(05 Marks)**
  (b) Draw the schematic diagram of a numerical relay and explain the functions of various components. **(06 Marks)**
  (c) The current rating of an Overcurrent relay is 5A. The relay has a plug setting of 150% and the time setting (TMS) of 0.4. The CT ratio is 400/5. Determine the operating time of the relay for a fault current of 6000A. At TMS=1, operating time at various PSM are given in the below table. **(05 Marks)**

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

Module-2

3.(a) With a neat sketch, explain the construction and working principle of a reverse power or directional relay. **(08 Marks)**
  (b) What is an impedance relay? Explain its operating principle, torque equation and operating characteristics for impedance relay. **(08 Marks)**

OR

4. **(a)** What are the advantages of numerical overcurrent relays over conventional overcurrent relays. **(04 Marks)**
  (b) Explain stepped time-distance characteristic of three distance relaying units used for I, II, III zone of protection. **(06 Marks)**
  (c) Figure.a shows distance protection for a section of a power system. The I zone setting at A and B is 150Ω.
  i) What will be impedance seen by the relay at A for a fault at F_1?
  ii) Will the relay at B trip for a fault at F_1 before the circuit breaker at A has tripped?

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iii) If the circuit breaker C_2 fails for a fault at F_2, will the fault be cleared by relays at A and B?

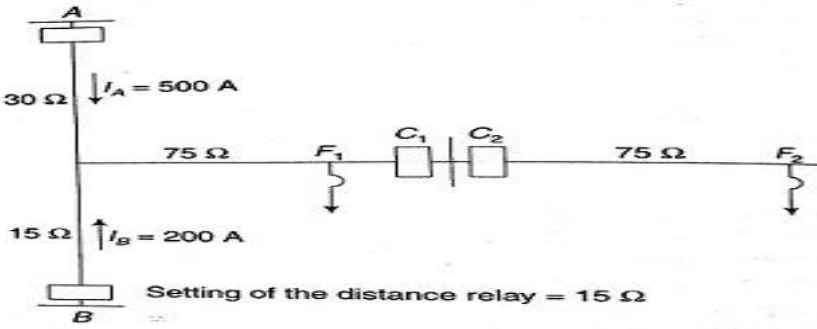iv) How will the fault at F_2 be cleared? **(06 Marks)**

Fig. a

Module-3

5. **(a)** Define the term 'pilot' with reference to power line protection. List the different types of wire pilot protection schemes and explain for any one of the scheme. **(08 Marks)**

(b) With a neat sketch explain the working of differential protection of 3-Phase circuits and balanced (opposed) voltage differential protection. **(08 Marks)**

OR

6. **(a)** What are the protective devices employed for the protection of an alternator against
   i) Overvoltage. ii) Overspeed? Discuss them in brief. **(06 Marks)**

(b) Write a short note on "Buchholz relay" used for the protection of transformers to detect incipient fault. **(05 Marks)**

(c) With a neat sketch explain the working of frame leakage protection used for buszone protection. **(05 Marks)**

Module-4

7. **(a)** With a neat sketch, explain the recovery rate theory and energy balance theory of arc interruption in a circuit breaker. **(09 Marks)**

(b) With a neat sketch and waveform explain the interruption of capacitive current. **(07 Marks)**

OR

8. **(a)** With a neat sketch explain the working of axial blast circuit breaker. **(05 Marks)**

(b) What are the advantages and disadvantages of SF_6 circuit breaker. **(06 Marks)**

(c) With a neat sketch, explain the direct testing of circuit breaker. **(05 Marks)**

Module-5

9. **(a)** Explain the construction and operation of the HRC Cartridge fuse. What are its advantages and disadvantages? **(08 Marks)**

(b) With a neat figure explain the working of ,
   i) Rod gap arrestor. ii) Expulsion type arrestor. **(08 Marks)**

OR

10. **(a)** State any four essential requirements of a surge diverter. **(04 Marks)**

(b) With a neat sketch, explain the construction and working of Klydonograph instrument used for the measurement of surge voltage. **(06 Marks)**

(c) Explain the modules/ components of GIS. **(06 Marks)**

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