CLASS: BE   SEMESTER: VII
BRANCH: EEE   SESSION : MO/2019

SUBJECT : EE7203 SWITCHGEAR AND PROTECTION

TIME: 1.5 HOURS   FULL MARKS: 25

INSTRUCTIONS:
1. The total marks of the questions are 30.
2. Candidates may attempt for all 30 marks.
3. In those cases where the marks obtained exceed 25 marks, the excess will be ignored.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. The missing data, if any, may be assumed suitably.

Q1 (a) Analyze the fault clearing time of a circuit breaker from the instant of fault inception   [2]
         time.
    (b) In a 220 kV system, the reactance and capacitance up to the location of circuit breaker is   [3]
         8Ω and $0.025\mu F$, respectively. A resistance of 600 ohms is connected across the contacts
         of the circuit breaker. Determine the following:
         I.   Natural frequency of oscillation
         II.   Damped frequency of oscillation
         III.   The critical value of resistance which will give no transient oscillations

Q2 (a) What is current chopping; explain with proper diagrams and governing equation.   [2]
    (b) Analyze the interruption process of a circuit breaker for capacitive current.   [3]

Q3 (a) Evaluate the coordination of different protection zones in power system network.   [2]
    (b) An earth fault develops at point F on the feeder as shown in Fig. 1, and the fault current   [3]
         is 16000 A. The IDMT relay at point A and B are fed via 800/5 A CTs. The relay at B has a
         plug setting of 125% and time multiplier setting of 0.2. The circuit breaker takes 0.20 s to
         clear the fault, and the relay error in each case is 0.15 s. For plug setting of 200% on the
         relay A, determine the minimum TMS on that relay for it not to operate before the circuit
         breaker at B has cleared the fault.
         At TMS = 1, operating time at various PSM are:

PSM	-	2	4	5	8	10	16	20
Operating time in (sec)	-	10	6	4.8	4.5	3	2.5	2.4

FIG.1

Q4 (a) Evaluate one application of directional over current relay.   [2]
    (b) A generator winding is protected by using a percentage differential relay whose   [3]
         characteristic is having a slope of 10%. Aground fault occurred near the terminal end of
         the generator winding while generator is carrying load. Assuming CT ratio of 500/5 A, I_1=
         400 + j0, I_2= 150 + j0. Will the relay operate to trip the circuit breaker?

Q5 (a) Discuss percentage differential protection scheme with proper mathematical   [2]
         representation.
    (b) Evaluate three zone protection mechanisms for distance relay with control logic diagram   [3]
         and R-X diagram.

Q6 (a) Differentiate between nit and non-unit protection mechanism?   [2]
    (b) Draw impedance, reactance and MHO characteristics to protect the 100 percent of the   [3]
         line having (2.5 + j6) ohm impedance. A fault may occur at any point on the line through
         an arc resistance of 2 ohms. Determine the maximum percentage of line section which
         can be protected by each type of relay.

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