VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD

Accredited by NAAC with A++ Grade

B.E. (E.E.E.) VII-Semester Supplementary Examinations, July-2022

Switchgear and Protection

Time: **3 hours** Max. Marks: **60**

Note: Answer all questions from Part-A and any FIVE from Part-B

Part-A (10 × 2 = 20 Marks)

Q. No.	Stem of the question	M	L	CO	PO
1.	Define the following terms with respect to an Over current relay i) Reset Value ii) Dropout Value	2	1	1	1,2,3,4,12
2.	Distinguish between an earth fault and phase fault	2	4	1	1,2,3,4,12
3.	Draw the characteristics of a Mho relay on R-X plane.	2	1	2	1,2,3,4,12
4.	Zone 3 setting of impedance relay at R ab is _____ % of line_____. 	2	4	2	1,2,3,4,12
5.	Differential protection distinguishes between magnetizing current and fault current based on _____ component of current.	2	1	3	1,2,3,4,12
6.	Earthing transformers in power system are used for_____	2	1	3	1,2,3,4,12
7.	The factors that affect the quenching of arc in Vacuum Circuit Breaker are_____	2	1	4	1,2,3,4,12
8.	State Recovery rate theory.	2	1	4	1,2,3,4,12
9.	Define the term protective ratio.	2	1	5	1,2,3,4,12
10.	Illustrate the functions of divided spark gap in non linear surge diverter.	2	2	5	1,2,3,4,12

Part-B (5 × 8 = 40 Marks)

11. a)	Discuss the Classification of the relays based on their time current characteristics.	4	1	1	1,2,3,4,12
b)	The current rating of an overcurrent realy is 5 A. The relay has a plug setting of 150 % and time multiplier setting of 150%and time multiplier setting of 0.4. The CT ratio is 400/5 .Determine the operating time of the relay for a fault current of 6000 A . At TMS=1 , operating time at various PSM are given below	4	3	1	1,2,3,4,12

PSM	2	4	5	8	10	20
Operating Time in (Sec)	10	5	4	3	2.8	2.4

12. a)	Explain the working of a micro processor based overcurrent relay and draw the block diagram.	4	2	2	1,2,3,4,12

		M	L	CO	PO
b)	For the 66 kV radial feeder shown in figure . Calculate zone 1,2 and 3 setting for the distance relay R$_{ab}$.	4	3	2	1,2,3,4,12

		M	L	CO	PO
13. a)	An 11 kV, 100 MVA alternator is provided with differential protection. The percentage of winding to be protected against phase to ground fault is 85%. The relay is set to operate when there is 20% out of balance current. Determine the value of the resistance to be placed in the neutral to ground connection.	4	3	3	1,2,3,4,12
b)	What are incipient faults in a transformer and explain how Buchholtz relay can be used to detect the faults.	4	2	3	1,2,3,4,12
14. a)	In a 132 kV system the inductance and capacitance upto the location of CB are 0.0095 H and 0.015 μF respectively. Determine a) The maximum value of restriking voltage across the contacts of CB b) Frequency of transient oscillation c) The maximum value of RRRV	4	3	4	1,2,3,4,12
b)	With a neat diagram explain the operation of puffer type SF$_6$ circuit breaker.	4	2	4	1,2,3,4,12
15. a)	Discuss the causes of overvoltage in arising on a power system	4	2	5	1,2,3,4,12
b)	A 33 kV, 3 phase 50 Hz, overhead line 60 km long has a capacitance to ground of each line equal to 0.015 μF/kM. determine the inductance and kVA rating of the Peterson coil.	4	3	5	1,2,3,4,12
16. a)	An earth fault develops at F on the feeder shown in the figure and the fault current 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 take 0.2 seconds to clear the fault and the relay error in each case is 0.15 seconds. For a 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. The operating time at PSM of 16 for a TMS of 1 is 2.5 Seconds	4	3	1	1,2,3,4,12
b)	Discuss the function of each element of control circuit for a three zone step distance relay.	4	2	2	1,2,3,4,12
17.	Answer any *two* of the following:				
a)	Draw the schematic of Transformer- Generator unit protection and discuss under what conditions this method will be used.	4	4	3	1,2,3,4,12
b)	Discuss the process of synthetic testing of circuit breakers for breaking capacity and making capacity of a circuit breaker with the help of a neat circuit diagram.	4	2	4	1,2,3,4,12
c)	Write a short notes on reducing tower footing resistance.	4	2	5	1,2,3,4,12

M : Marks;   L: Bloom's Taxonomy Level;   CO; Course Outcome;   PO: Programme Outcome

i)	Blooms Taxonomy Level – 1	23.68%
ii)	Blooms Taxonomy Level – 2	34.22%
iii)	Blooms Taxonomy Level – 3 & 4	42.10%

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