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**PRESIDENCY UNIVERSITY
BENGALURU**

**SCHOOL OF ENGINEERING
END TERM EXAMINATION - JUN 2023**

Semester : Semester VI - 2020

Course Code : EEE3003

Course Name : Sem VI - EEE3003 - Switchgear and Protection

Program : EEE

Date : 7-JUN-2023

Time : 9.30AM - 12.30PM

Max Marks : 100

Weightage : 50%

Instructions:

- (i) Read all questions carefully and answer accordingly.
 - (ii) Question paper consists of 3 parts.
 - (iii) Scientific and non-programmable calculator are permitted.
 - (iv) Do not write any information on the question paper other than Roll Number.
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PART A

ANSWER ALL THE QUESTIONS

(10 X 3 = 30M)

1. List out three characteristics of circuit breaker. (CO2) [Knowledge]
2. What is the role of earthing switch and isolator in power system protection? (CO1) [Knowledge]
3. List out three methods to increase the resistance of the arc. (CO2) [Knowledge]
4. Draw the diagram of definite distance relay with proper labelling. (CO4) [Knowledge]
5. Draw balanced beam type relay with proper labelling and explain its operation. (CO3) [Knowledge]
6. List out three applications of directional overcurrent relay. (CO4) [Knowledge]
7. Explain overlapping zone in power system protection with proper diagram. (CO3) [Knowledge]
8. Explain the role of principal and auxiliary switchgear in power system protection. (CO1) [Knowledge]
9. Explain the operation of the directional overcurrent relay with a proper circuit diagram. (CO4) [Knowledge]
10. What is a relay and draw the diagram of protective relay scheme with proper labelling. (CO3) [Knowledge]

PART B

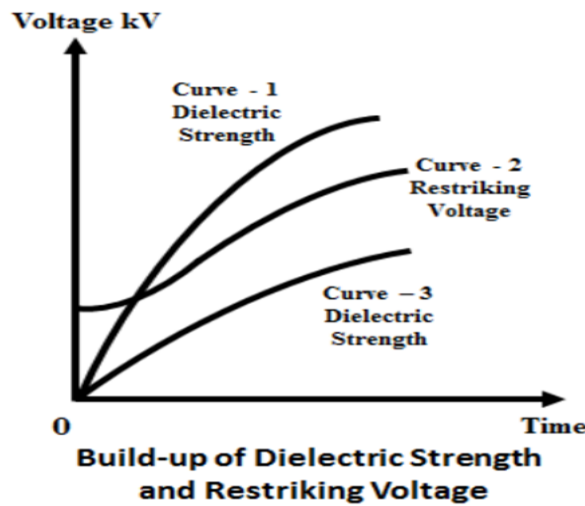
ANSWER ALL THE QUESTIONS

(2 X 15 = 30M)

11. Mr. Maheh needs to replace the old current transformers with new ones for upgrading the protection system. Prove that the pick-up current of the relay would remain the same for both the old CT and the new CT. (Assume the old CT ratio is 500:1, Old PSM = 2.25 and the New CT Ratio is 900:5, New PSM= 0.6825)

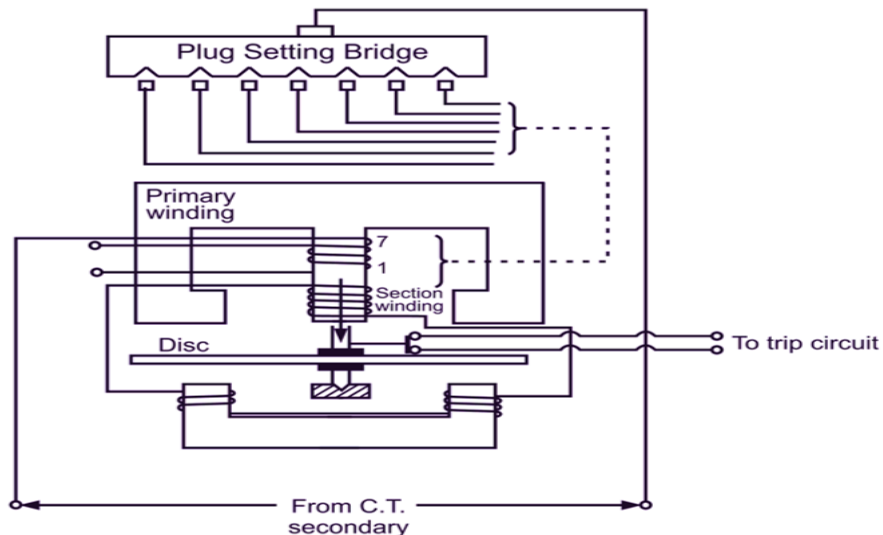
(CO3) [Comprehension]

12. Mr. Kamalkant brought three types of insulating medium for the circuit breaker and its dielectric strength is shown in the below figure. Identify the best insulating medium for the circuit breaker which can extinguish the arc effectively in the minimum possible time. Also, state the important factor in extinguishing the arc in the circuit breaker without any restriking of the arc.



(CO2) [Comprehension]

13. Mr. Venkatesh doing his research on overcurrent relay (shown in figure below) which operates when the fault current exceeds the pickup current. His intention is to make the fault current flow in both the directions through the relay either forward or reverse, depending upon fault location. Therefore, it is necessary to make the relay respond for a particular defined direction, so that proper discrimination is possible. Kindly help Mr. Venkatesh in adding the feature of direction to the overcurrent relay. What are the changes Mr. Venkatesh has to do in the below figure to add the directional feature? Explain with proper circuit diagram.



(CO4) [Comprehension]

PART C

ANSWER ALL THE QUESTIONS

(2 X 20 = 40M)

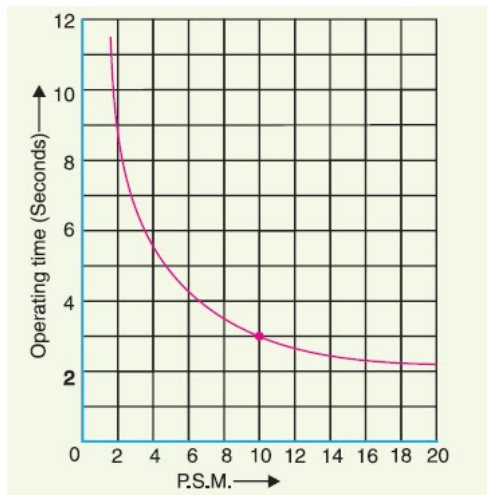
14. A circuit breaker rated 1500A, 1000MVA, 33 kV, 3 sec, 3 phase oil CB.

Find

- rated normal current
- Breaking capacity
- Rated symmetrical current
- Rated making current
- Rated service voltage
- Short Time Rating of Circuit Breaker

(CO2) [Application]

15. A circuit breaker is equipped with 600/5 A C.T, connected to an induction-type overcurrent relay. The relays have a 120% plug setting and 0.6-time setting. If a 3- ϕ fault current of 8000 A flows from C.T. and relays follow the characteristics curve given below at TMS = 1, then find the actual operating time of the relay.



(CO3) [Application]