

## B.E. Power Engineering - Fourth Year - First Semester, 2019

## POWER SYSTEM PROTECTION

TIME: THREE HOURS

FULL MARKS: 100

- |                                                                                             |    |
|---------------------------------------------------------------------------------------------|----|
| 1. Discuss various types of over voltages.                                                  | 20 |
| OR                                                                                          |    |
| 1. Give a note on restriking voltage.                                                       | 20 |
| 2. a) Discuss functions of protective relay.                                                | 8  |
| b) Discuss the fundamental requirements of protective relay.                                | 12 |
| OR                                                                                          |    |
| 2. Give a note on static relay.                                                             | 20 |
| 3. a) Discuss the mechanism of arc initiation in a circuit breaker.                         | 8  |
| b) Give a note on vacuum circuit breaker.                                                   | 12 |
| OR                                                                                          |    |
| 3. a) Discuss the merits and demerits of air-blast circuit breaker.                         | 10 |
| b) Give a note on SF <sub>6</sub> circuit breaker.                                          | 10 |
| 4) Give a note on alternator protection.                                                    | 20 |
| OR                                                                                          |    |
| 4. a) Give a note on transformer protection.                                                | 10 |
| b) What are the essential characteristics of lightning arrester?                            | 4  |
| c) Discuss why gapless arresters have replaced the conventional type of lightning arrester. | 6  |

5. A line to line fault occurs at point F on phases b and c through a fault impedance  $Z_F$ . Find the fault currents. 20

OR

5. A single line-to-ground fault occurs on line 'a' at point F in the system shown in Fig. 5. Find the fault current in phase 'a' of generator, assuming pre-fault currents to be zero. Both machines are rated 1200 KVA, 600V with reactances of  $X_1=X_2=10\%$  and  $X_0=5\%$ . Each three phase transformer is rated 1200 KVA, 600V- $\Delta$ / 3300V-Y with leakage reactance 5%. The reactances of the transmission line are  $X_1=X_2=20\%$  and  $X_0=40\%$  on a base of 1200 KVA, 3300V. The reactances of the neutral grounding reactors are 5% on the KVA base of the machines. 20

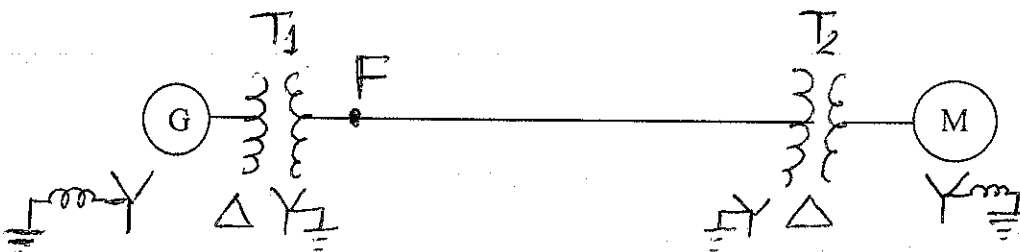


Fig. 5