Registration No : | | | | | | | | | | |

Total Number of Pages : 02 **B.Tech**
PEE7J001

7th Semester Regular Examination 2018-19
SWITCH GEAR & PROTECTIVE DEVICES
BRANCH : ELECTRICAL
Time : 3 Hours
Max Marks : 100
Q.CODE : E039

Answer Question No.1 (Part-1) which is compulsory, any EIGHT from Part-II and any TWO from Part-III.
The figures in the right hand margin indicate marks.

Part- I

Q1 **Short Answer Type Questions (Answer All-10)** **(2 x 10)**

a) What is meant by the reach of the relay?
b) How directional overcurrent relays sense the direction of the fault?
c) What function a linear coupler serves in protection schemes?
d) How mal-operation due to power swings can be prevented?
e) How the inrush phenomena are tackled in a protection schemes?
f) What do you understand by short circuit capacity of a bus?
g) What advantages numerical relays have over static relays?
h) What are the advantages of auto-reclosing?
i) What is the basic difference between restriking and recovery voltage?
j) What is the significance of RRRV in connection with switchgears?

Part- II

Q2 **Focused-Short Answer Type Questions- (Answer Any EIGHT out of TWELVE)** **(6 x 8)**

a) Describe the various zones of protection.
b) Mention the basic attributes that a protection system must possess.
c) Derive the universal relay equation.
d) Show that the amplitude and phase comparators are dual to each other.
e) Draw the characteristics of distance relays.
f) Draw the sequence networks of various transformer connections.
g) Draw the connection diagram for earth fault protection of a generator.
h) Describe the purpose and reach of different steps of a three stepped distance protection.
i) Describe the function of supervisory relay.
j) Draw the block diagram of a numerical relay.
k) Describe a scheme for numerical differential protection.
l) Draw the schematic diagram of a minimum oil circuit breaker.

Part-III

Long Answer Type Questions (Answer Any TWO out of FOUR)

Q3 Describe the significance of positive, negative and zero sequence components. **(16)**

A 25 MVA, 13.2 kV alternator with solidly grounded neutral has a subtransient reactance of 0.25 pu. The negative and zero sequence reactances are 0.35 and 0.1 pu respectively. A single line to ground fault occurs at the terminals of the unloaded alternator. Determine the fault current and the line-to-line voltages. Neglect resistance.

Q4 Describe the different characteristics of overcurrent relays and their suitability. **(16)**

Determine the time of operation of a relay of rating 5 amps, 2.2 sec IDMT and having relay setting of 125% with TMS=0.6. It is connected to a supply circuit through a CT of 400/5 ratio. The fault current is 4000A.

Q5 Describe the various bus-bar protection schemes. **(16)**

A 6.6 kV, 5 MVA star connected alternator has a reactance of 1.5 ohm per phase and negligible resistance. Merz-Price protection scheme is used which operates when out of balance current exceeds 25 % of the full load current. The neutral of the generator is grounded through a resistance of 8 ohms. Determine the proportion of the winding which remains unprotected against earth fault.

Q6 Explain rated breaking capacity and rated making capacity of circuit breakers. **(16)**

Calculate the RRRV of a 220 kV circuit breaker with earthed neutral. The short-circuit test data is obtained as follows: the current broken is symmetrical and the restriking voltage has an oscillatory frequency of 15 kHz. The power factor of the fault is 0.2. Assume the short-circuit to be an earthed fault.