A Government College of Engineering, Aurangabad
(An Autonomous Institute of Government of Maharashtra)
M. E. (EEP-PT) Examination
End Semester Examination NOV 2016
EE557 ADVANCED SWITCHGEAR AND PROTECTION

Time: Three Hours *Date:* 2 NOV 2016 *Max. Marks: 60*

N.B:-1. Solve any four questions.
2. Figures to the right indicate full marks
3. Assume suitable data if necessary and state it clearly
4. Use of non-programmable calculator is allowed

Q1 a) Discuss arc interruption phenomenon and explain theory related to arc interruption 05M
i) Prince's theory.
ii) Cassie theory.

b) What are the advantages and limitations of static relay? Draw and explain block diagram of static instantaneous over current relay. 05M

c) Discuss the comparative benefit and limitations of static, digital and numerical relay 05M

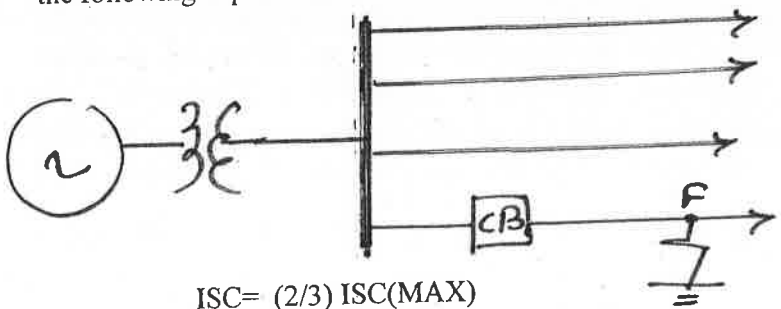
Q2 a) What is meant by indirect testing? Explain unit or synthetic testing in circuit breaker. 05M

b) An overhead transmission line having surge impedance of 600 ohms branches into two lines having surge impedance of 40 ohm and 60 ohm respectively. If the travelling wave of vertical front and magnitude of 100 KV travel along the line. Find magnitude of voltage and current in overhead line in two branches immediately after travelling wave has reached fork. 05M

c) What are the essential properties of arc? Distinguish between static and dynamic characteristics. 05M

Q3 a) Show that the travelling wave move with a velocity of light on the overhead line and its speed is proportional to $1/\sqrt{\varepsilon r}$ on a cable with dielectric material of permittivity εr. 08M

b) Explain terms 'severity factor ' and 'kilometric fault'. State the factors on which it depend. Derive the following expression for severe-most conditions for circuit breaker. 07M



ISC= (2/3) ISC(MAX)

Q4 a) Explain in detail devices used for numerical relay 07M

b) Explain any three following design concept related to high voltage vacuum circuit breaker, 08M
i) Contact material.
ii) Length of interrupter.
iii) Time travel characteristic
iv) Close speed requirement

Q5 a) Write a short note (any two) 08M

i) Digital protection in power system

ii) Relay based on statistical nature of noise.

iii) Types of amplitude comparator.

iv) Various specifications for circuit breaker.

b) A 132/66 KV substation has large number of feeders going out from the 66 KV bus. Each of these feeders has a reactance/phase of 0.3 ohms/km and the source reactance including of transformer is 4.5 ohms, referred to 66 KV side. 07M

Estimate the distance of a point on the line a fault at which would cause the maximum severity factor at the circuit breaker. Determine also the value of this severity factor. Neglect resistance.