Printed Pages: 02
Paper Id: 236551

Sub Code: KEE- 601
Roll No.

B.TECH
(SEM VI) THEORY EXAMINATION 2022-23
POWER SYSTEM-II

Time: 3 Hours *Total Marks: 100*

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. **2 x 10 = 20**

(a) Prove that $1+\alpha+\alpha^2 = 0$, where α is the operator.

(b) The per-unit impedance of an alternator corresponding to base values 13.2 kV and 30 MVA is 0.2 p.u. The p.u. value of the impedance for base values 13.8 kV and 50 MVA in p.u. will be.....

(c) Explain the significance of slack bus. Why it is also named as reference bus.

(d) Mention four important reasons why load flow studies are performed.

(e) A travelling wave of magnitude 200 V in transmission line of surge impedance 400 ohms passes into a cable of surge impedance 40 ohms .What will be refraction voltage magnitude travelling into the cable

(f) Determine the magnitudes of refraction and reflection coefficients if a travelling wave is terminated by an open circuit condition.

(g) Mention the various factors to improve transient state stability.

(h) Define accelerating power 'Pa'.

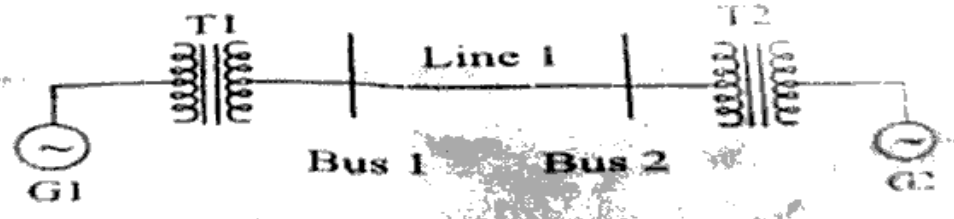
(i) Explain the term pick up value of the relay

(j) Calculate the Breaking current of a 3 phase oil circuit breaker rated at 66KV, 3000MVA, 1000A, 3-secs.

SECTION B

2. Attempt any *three* of the following: **10x3=30**

(a) For the following power system network shown in the figure draw a reactance diagram , the specifications of the component are as follows:
G1: 25 KV, 100 MVA, X=9%
G2: 25 KV, 100 MVA, X=9%
T1: 25 / 220 kV, 90 MVA, X=12%
T2: 220 KV/25 kV, 90 MVA, X=12%
Transmission Line 1: 220 KV, X=150 ohms.
Choose 25 KV as the base voltage and 200 MVA as the MVA base.



(b) Draw and explain the steps in a flow chart for load flow solution using Gauss Seidel method when both PV and PQ buses are present.

(c) Derive the equation for a travelling wave which travels over a uniform transmission line of surge impedance Zc..

(d) Explain equal area criteria by taking suitable example of power system.

(e) Explain the low resistance and high resistance methods of arc extinction in a circuit breaker.

SECTION C

3. Attempt any *one* part of the following: **10x1=10**

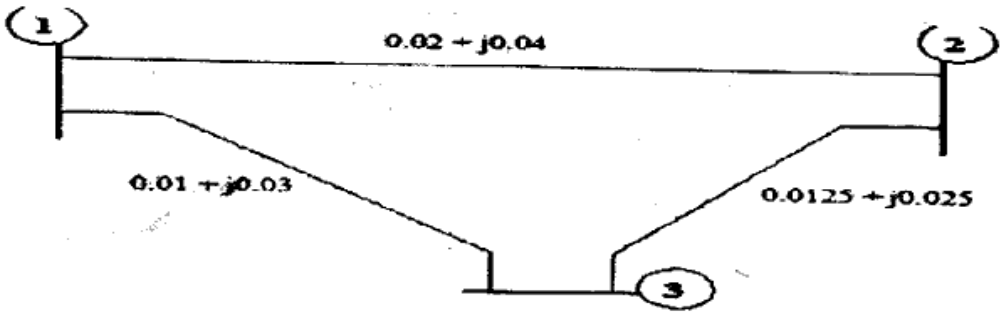
(a) Derive an expression for a fault current when L-G fault occurs in the line and draw the sequence network showing inter-connections.

(b) A 25 MVA ,13.2KV alternator with solidly grounded neutral has a sub transient reactance of 0.25p.u . The negative and zero sequence reactance are 0.35 and 0.1 p.u respectively. A double line to ground fault occurs at the terminals of unloaded alternator derive the expression for fault current and compute the same , in all the phases.

4. Attempt any *one* part of the following: **10x1=10**

(a) Explain the three types of buses in power system. Describe how the power flows and losses are calculated in load flow solution, with suitable derivations.

(b) Form the elements of y bus for a below network. Admittance between nodes 1 -2 is 0.02+j0.04 , between node 2-3 is 0.0125+j0.025 , between node 1-3 is 0.01+j0.03 . Assemble the Y_{BUS} and obtain the impedance metrix.



5. Attempt any *one* part of the following: **10x1=10**

(a) Derive the expression of refleution and refraction coefficient of voltage and current when a line is terminated by a resistance R.

(b) Explain Bewlays Lattice diagram with a suitable example . What information is obtained from Bewlays Lattice diagram.

6. Attempt any *one* part of the following: **10x1=10**

(a) Derive the swing equation for a machine connected to an infinite bus.. If a synchronous generator is of 100MVA have inertia constant of 20MJ/MVA. Find the angular momentum.

(b) Derive an expression for maximum power between two nodes. Show that this power is maximum when $x=\sqrt{3}R$, where X is the reactance and R is the resistance and torque angle is 60^0.

7. Attempt any *one* part of the following: **10x1=10**

(a) Explain the working principle of differential relay and derive its operational condition with a suitable diagram. Why restraining coil is used in differential relay?

(b) Explain the arcing phenomenon in circuit breaker. Define the terms restriking voltage and recovery voltage with a suitable diagram.