No. of Printed Pages : 4

BIEE-022

B.Tech. – VIEP – ELECTRICAL ENGINEERING

(BTELVI)

00123

Term-End Examination

June, 2018

BIEE-022 : POWER SYSTEMS

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **five** questions. All questions carry equal marks. Assume missing data suitably (if any). Use of scientific calculator is allowed.*

1. (a) Describe single-line diagram representing synchronous machines, transformers and feeders from generating end to distributing end. 7

(b) Three generators are rated as follows :

Generator 1 : 100 MVA, 33 kV,
reactance = 10%

Generator 2 : 150 MVA, 32 kV,
reactance = 8%

Generator 3 : 110 MVA, 30 kV,
reactance = 12%

Choosing 200 MVA and 35 kV as base quantities, compute the per unit reactances of the three generators referred to these base quantities. Draw the reactance diagram and mark per unit reactances. The three generators are connected to a common bus. 7

2. (a) Compute symmetrical components of the three-phase voltages.
$V_A = 100 \angle 0°$, $V_B = 110 \angle -100°$ and $V_C = 115 \angle +110°$. 7

(b) Obtain an expression for generation of an asymmetrical current in a series R-L circuit, when switch is closed to retain normal operation of power system. The circuit is energized by a sinusoidal ac source of $V_m \sin(\omega t + \alpha)$. 7

3. (a) A double line-to-ground fault occurs on phase b and c of an unloaded generator. Derive a sequence network representation of this condition and determine the fault current. 7

(b) A short circuit to earth occurs near the terminals of phase A of a 3-ϕ alternator, star-connected with neutral point earthed, the current to earth being 1000 A. If the alternator is not supplying any normal current, calculate positive, negative and zero sequence components of currents of all phases. 7

4. (a) Discuss the classification of buses for power flow analysis. What is Y_{BUS} ? Explain the development of power flow equation. 7

(b) Explain algorithm for solution of load flow problem using the Newton–Raphson method when the system consists of all types of buses. 7

5. (a) Explain the concept of equal area criterion. How can it be used to study transient stability ? 7

(b) Distinguish between steady state, transient state and dynamic stability. Derive the swing equation of a synchronous machine. 7

6. (a) Derive the wave equation for uniform transmission lines. 7

(b) A surge of 100 kV is incident on a line having a surge impedance of 400 Ω. It meets a cable of 40 Ω. Calculate the transmitted voltage and reflected voltage. 7

7. (a) Explain the procedure for drawing Bewley's lattice diagram with the help of a suitable example. 7

(b) What are the factors affecting steady state and transient stability ? 7