

**B.Tech. – VIEP – ELECTRICAL ENGINEERING
(BTELVI)**

Term-End Examination

June, 2015

00646

BIEE-022 : POWER SYSTEMS

Time : 3 hours

Maximum Marks : 70

Note : *Attempt five questions in all. All questions carry equal marks. In case of numerical problems, assume suitable data wherever not provided. Use of scientific calculator is allowed.*

1. (a) Draw a simple per-phase model for a cylindrical rotor synchronous machine. Also write the advantages of per-unit system. 7
- (b) What do you understand by symmetrical components of unbalanced phasors ? Deduce the expressions for symmetrical components. 7
2. (a) The phase currents described by a three-phase system are $I_a = (3 + j1.5)$, $I_b = (3 - j3)$ and $I_c = (-3.75 + j2.5)$. Calculate the sequence components of the currents. 7
- (b) Deduce the expression for system impedance matrix in bus frame of reference (Z_{BUS}) using singular transformation. 7

3. Why is load flow study essential for a power system ? Draw the flow chart for load flow solution by the Gauss-Siedel iterative method using Y_{BUS} . 4+10=14
4. (a) Using equal area criterion, derive an expression for critical clearing angle for a system having a generator feeding a large system through double circuit line. 10
- (b) What are the different factors that affect steady state stability? 4
5. (a) Explain the procedure for drawing Bewley's lattice diagram with the help of a suitable example. 7
- (b) Starting from the first principles, show that surges behave as travelling waves. 7
6. (a) Derive the swing equation of a synchronous machine connected to an infinite bus. 7
- (b) Discuss the assumption made for short circuit analysis of a power system. Also mention the objectives of short circuit analysis. 7
7. (a) Discuss the decoupled and fast decoupled method of load flow analysis. 7
- (b) Show that the steady state power which could be transmitted over a transmission line will be maximum when $X = \sqrt{3} R$, where X and R have their usual meanings. 7