# B.Tech. – VIEP – ELECTRICAL ENGINEERING (BTELVI)
## Term-End Examination
## December, 2015

### BIEE-022 : POWER SYSTEMS

Time : 3 hours                    Maximum Marks : 70

**Note :** Attempt any **five** questions. All questions carry equal marks. Use of scientific calculator is allowed. Missing data, if any, may be suitably assumed.

1.  (a)   Discuss the advantages of Per Unit (PU) system.                                               7

    (b)   Derive an expression for

    $$Z(PU) = Z(\Omega) \times \frac{(MVA)_{Base}}{(kV)^2_{Base}} \, .$$

    Obtain the per unit (reactance) diagram of the power system.

    Generator No. 1 : 50 MVA, 10·5 kV, $X'' = 1·45 \, \Omega$, $X_{n1} = 0·5 \, \Omega$

    Generator No. 2 : 20 MVA, 6·6 kV, $X'' = 1·23 \, \Omega$, $X_{n2} = 0·5 \, \Omega$

    Transformer T1 (3-phase) : 20 MVA, 33/11 kV, $X = 15·23 \, \Omega$ per phase on high tension side.

    Transformer T2 (3-phase) : 20 MVA, 33/6·2 kV, $X = 16·17 \, \Omega$ per phase on high tension side.

    Transmission line : 22·5 $\Omega$/phase.                7

**2.** Mention two objectives of short circuit analysis. Deduce and draw the sequence network for a line to ground fault at the terminals of an unloaded generator. *14*

**3.** Why is the load flow study required ? Explain the Newton-Raphson method and its advantages over the Gauss-Siedel method. *2+10+2=14*

**4.** (a) Explain the application of equal area criterion to study the transient stability for a sustained line fault. *7*

(b) Discuss the factors affecting the transient stability. How can the transient stability be improved ? *7*

**5.** (a) Explain Bewley's lattice diagram. *7*

(b) Determine the reflection and refraction coefficient for a short circuit transmission line. *7*

**6.** (a) With the help of equal area criterion, explain how the automatic reclosing circuit breaker and turbine fast valving help to improve the system stability. *7*

(b) Find out the swing equation for a group of

(i) Coherent condition, and

(ii) Non-coherent condition. *7*

**7.** Write short notes on any *two* of the following : $2\times7=14$

(a) Surge impedance

(b) Transient in R-L series circuit

(c) Formation of Z bus using singular transformation

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