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BIEE-022

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

Term-End Examination

00783

December, 2016

BIEE-022 : POWER SYSTEMS

Time : 3 hours *Maximum Marks : 70*

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

1. (a) What is per unit (p.u.) system ? Discuss the procedure to convert the actual values into per unit values with the help of suitable example. 7

(b) The line currents in a 3-phase supply to an unbalanced load are $I_a = 10 + j20$, $I_b = 12 - j10$ and $I_c = -3 - j5$ amperes. The phase sequence is abc. Determine the sequence components of the currents. 7

2. (a) What are the various unsymmetrical faults ? Derive the expression of single line to ground fault through Z_f on phase 'a' of unloaded generator. 7

(b) A three-phase generator rated at 11 kV, 20 MVA has a solidly grounded neutral. Its positive, negative and zero sequence reactances are 60%, 25% and 15% respectively.

(i) Determine the value of reactance that should be placed in the generator neutral such that the current for single line to ground fault does not exceed the rated current.

(ii) What value of the resistance in the neutral will serve the same purpose ? *7*

3. Explain the Newton-Raphson Algorithm for load flow solution. *14*

4. (a) Derive the Swing equation. Why is the Swing equation so important in the study of transient stability ? *7*

(b) A 30 MVA, 15 kV, 4-pole, 50 Hz turbo-alternator has an inertia constant of 10 kW-sec/kVA.

(i) Compute the kinetic energy stored by the rotor at synchronous speed.

(ii) If the input power and output power are 25 MW and 20 MW respectively, find the acceleration in deg/sec^2. *7*

5. Discuss the phenomenon of travelling wave over a transmission line. Establish the relation between the voltage and current waves travelling over the transmission line and for their velocity of propagation. Also derive an expression for the velocity of propagation for overhead line. *14*

6. (a) Discuss the purpose of load flow studies of a power system. Also classify the buses for load flow analysis. *7*

   (b) Discuss the various methods for transient stability improvements. *7*

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

   (a) Computer Method for Short Circuit Calculations

   (b) Nodal Admittance Matrix

   (c) Decoupled and Fast Decoupled Method of Load Flow Analysis