M.Tech. Electrical Power System (CBCS Pattern) Semester-II

# PEPS241 - Computer Application in Power Systems

P. Pages : 2 **GUG/S/25/11025**

Time : Three Hours * 1 1 5 4 * Max. Marks : 70

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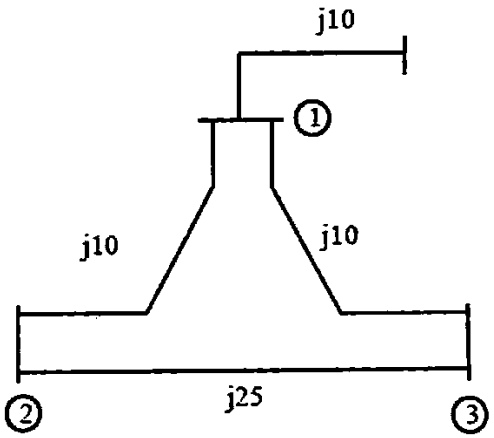
Notes : 1. All questions carry equal marks.
2. Due credit will be given to neatness and adequate dimensions.
3. Assume suitable data wherever necessary.
4. Illustrate your answers wherever necessary with the help of neat sketches.
5. Answer **any five** questions.
6. Use of non-programmable calculator is permitted.

**1.** a) Prove that - Loop Impedance Matrix **7**

$$Z_{loop} = C^t[Z]C$$

Where all abbreviations have their conventional meanings.

b) Form the $Z_{BUS}$ of the given power system as shown in fig. **7**




**2.** a) Write down the performance equation of the three phase element in impedance and admittance form. **7**

b) Using suitable transformation matrix 'T' transform the three phase impedance matrix to its equivalent in 0, l, 2 sequence quantities. Assume rotating elements. **7**

**3.** For the power system described in Fig. 3. **14**

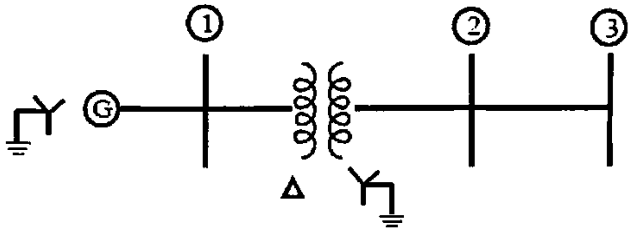



Fig. 3(a)

$G : Z_1 = Z_2 = 0.1\ Z_0 = 0.05$ PU

$T : Z_1 = Z_2 = Z_0 = 0.08$ PU

Line : $Z_1 = Z_2 = 0.2,\ Z_0 = 0.4$

Find the fault voltage for double line to ground fault at bus (2) with fault impedance in P.U. shown in fig.2.

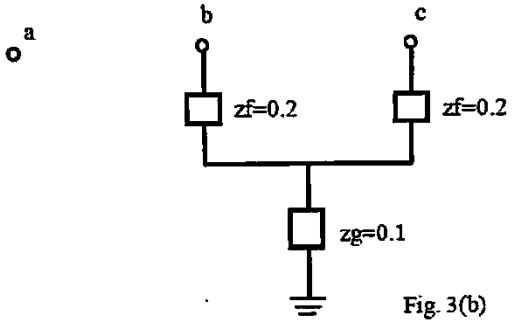



Fig. 3(b)

**4.** a) Derive the equations for the total fault current in terms of symmetrical components and phase quantities for the following faults at bus P for a general system : **7**
   i) Three- phase (Not grounded)
   ii) Line-to- Line

   b) Write a short note on : **7**
   i) Importance of short circuit study
   ii) Three phase balanced networks and faults

**5.** a) Derive the elements of Jacobian matrix used in Newton Raphson method for load flow studies. **7**

   b) Draw only a flow chart part showing the steps to be followed while "voltage controlled Buses" are included in the system data when minimum and maximum reactive power limits on that Bus are known along with specified magnitude of Bus voltage. Use Gauss- Seidal iterative method with $Y_{Bus}$ for load flow analysis. **7**

**6.** a) How are buses classified in load flow analysis? Mention the known and unknown quantities on each bus. **7**

   b) With the help of a flow chart, discuss the algorithm to be used for transient stability study of power system which employs the modified Euler method. **7**

**7.** a) The power transfer curves for a certain power system is described by the equation given below. If the prefault power output is 1.0 p.u. compute the variation in $\delta$ (delta) and a (omega) with time. Assume that fault is cleared at 0.15 seconds from its inception. Assume $\Delta t = 0.05$ . The inertia constant H = 4. Perform the computations upto 0.5 sec only. **10**

   Prefault power equation $Pe_1 = 2\sin\delta$

   During fault $Pe_2 = 0.5\sin\delta$

   Post fault $Pe_2 = 1.5\sin\delta$

   b) Explain objectives of transient stability study. **4**

**8.** a) Write a short note on : **8**
   i) Economic load dispatch considering losses.
   ii) Optimal power flow.

   b) Derive coordinate equation using Lagrange method for the solution of economic schedule. **6**

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