**Roll No.** [          ]                    **Total No. of Pages : 02**

**Total No. of Questions : 08**

**M.Tech. Electrical (Power System)  (Sem.–1)**
# POWER SYSTEM ANALYSIS
**Subject Code : EEPS-101-18**
**Paper ID : [75731]**

**Time : 3 Hrs.**                    **Max. Marks : 60**

**INSTRUCTIONS TO CANDIDATES :**
**1.Attempt any FIVE questions out of EIGHT questions.**
**2.Each question carries TWELVE marks.**

1)  For the network with details as given below and bus 1 as the slack bus, use FDLF method to obtain two iterations for the load flow solution. The line and bus data is given in Table-1 and Table-2, respectively.

**Table-1 : Line data (All quantities are in p.u.)**

| Line Number | Between Buses | Line Impedance | Half Line charging admittance |
|---|---|---|---|
| 1 | 1-2 | j0.12 | 0 |
| 2 | 2-3 | j0.25 | 0 |
| 3 | 1-3 | j0.33 | 0 |

**Table-2 : Bus data**

| Bus No. | Type | Generator | | Load | | Voltage magnitude | Reactive power limit | |
|---|---|---|---|---|---|---|---|---|
| | | P | Q | P | Q | | $Q_{min}$ | $Q_{max}$ |
| 1 | Slack | - | - | - | - | 1.0 | - | - |
| 2 | P-V | 5.3217 | - | - | - | 1.1 | 0 | 5.3217 |
| 3 | P-Q | - | - | 3.6412 | 0.5459 | - | - | - |

2) What are symmetrical components? Discuss their significance. Derive the expressions to convert the phase quantities to the sequence components and vice-versa.

3) Show the interconnection of sequence networks for a 'two conductors open' fault occurring in a power system network. Derive the relevant results.

4) What do you understand by state estimation? In what application areas state estimation concepts are beneficial? How can the bad measurements be measured and identified? Write the orthogonal decomposition method used for state estimation.

5) Discuss the contingency analysis for power systems using Brown's method.

6) What is the motivation behind using WARD equivalent method? Discuss with the help of a case study the application of WARD method in a power system network.

7) Define the terms : Voltage Stability and Voltage Collapse. What are the reasons of voltage collapse? Explain with the help of PV curves. What are the various mitigation methods to avoid voltage collapse?

8) Write short notes on the following :

   a) Observability

   b) Security state diagram

   c) Sparsity techniques