**Exam.Code:1017**
**Sub. Code: 35251**

**2076**

**M.E. Electrical Engineering (Power System)**

**First Semester**

**EE (PS)-8101: Advanced Power System Analysis**

**Time allowed: 3 Hours** **Max. Marks: 50**

***NOTE: Attempt any five questions.***

*x-x-x*

**Q1** Classify power system faults and explain the analysis of balanced and unbalanced faults. Discuss the significance of symmetrical components in the analysis of unsymmetrical faults with suitable illustrations. (10 Marks)

**Q2** Two thermal generating units supply a total load of 250 MW. The fuel cost functions are: (10 Marks)

$$F_1 = 500 + 5P_1 + 0.004P_1^2 \ (Rs/h)$$
$$F_2 = 400 + 6P_2 + 0.006P_2^2 \ (Rs/h)$$

Neglect transmission losses. Determine: a) The optimal generation schedule, b) The optimal fuel cost.

**Q3** Develop primitive admittance matrix, bus incidence matrix, bus admittance matrix using singular transformation for the system shown in Fig. 1, whose line data is given in Table 1. Take 0 as the ground bus. (10 Marks)

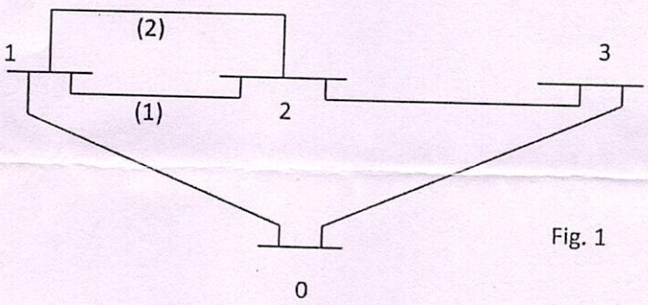


Fig. 1

Table 1

| Line (bus-bus) | 0-1 | 1-2 (1) | 1-2(2) | 2-3 | 0-3 |
|---|---|---|---|---|---|
| R(p.u.) | 0 | 0 | 0 | 0 | 0 |
| X(p.u.) | 0.10 | 0.08 | 0.08 | 0.16 | 0.10 |

**Q4** A regulating transformer with an off-nominal turns ratio is connected between two buses of a power system. Explain how it modifies the Ybus. (10 Marks)

**Q5** Derive the Decoupled Load Flow equations from the Newton–Raphson load flow method by simplifying the Jacobian matrix. (10 Marks)

**Q6** Explain the Least Squares method for estimating the state variables of a power system. (10 marks)

**Q7** State the objectives and constraints of an Optimal Power Flow problem. Explain the Gradient Method for solving the Optimal Power Flow problem. (10 marks)

**Q8** Why is AC–DC Load Flow analysis required in modern power systems? explain the basic components and solution technique of an AC–DC load flow. (10 Marks)

*x-x-x*