BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION)

CLASS: BE **SEMESTER: VII**
BRANCH: EEE **SESSION : MO/2018**

SUBJECT : EE7211 COMPUTER AIDED POWER SYSTEM ANALYSIS

TIME: 1.5 HOURS **FULL MARKS: 25**

INSTRUCTIONS:
1. The total marks of the questions are 30.
2. Candidates may attempt for all 30 marks.
3. In those cases where the marks obtained exceed 25 marks, the excess will be ignored.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. The missing data, if any, may be assumed suitably.

Q1 (a) How the Y_{bus} matrix gets modified if there is a voltage magnitude regulating transformer with off – nominal tap ratio present between any two buses of a three bus system. Write modified Y_{bus} only. [2]

(b) With necessary connection diagram and phasor diagram, prove that a transformer can be used as regulating transformer for both voltage magnitude and phase control. [3]

Q2 (a) Mention the state and control variables considered in load flow analysis. [2]

(b) Derive the final equations in NR method with full derivation of jacobian elements when PQ buses are only present in the system. [3]

Q3 In a three bus system, generators are connected with bus 1 and bus 3.The magnitude of voltage at bus 1 is adjusted to 1.05 pu and voltage angle is 0 degree. Voltage magnitude at bus 3 is fixed at 1.04 pu with real power generation 200 MW. A load consisting of 400 MW and 200Mvar is taken from bus 2. Consider 100 MVA as base MVA. Obtain all the elements of two decoupled equation of Decoupled Load Flow method. Consider Y bus as follows: [5]

Y_{bus}=[20-j50 -10 +j20 - 10+j30; -10+j20 26-j52 -16+j32; -10+j30 -16+j32 26-j62]

Q4 (a) Mention the importance of phase shifting and three winding transformer. [2]

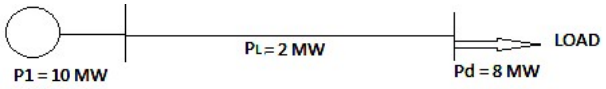
(b) Why Jacobian matrix in the case of load flow analysis is a sparse matrix? Elaborate one method for modification of Y_{bus} matrix in order to minimize the computational effort and computer storage. [3]

Q5 (a) With one appropriate example, show that Power loss. $P_L = \sum_{i=1}^{n} \sum_{j=1}^{n} P_i B_{ij} P_j$ where n is the number of generator. [2]

(b) Write the steps of solving ELD with consideration of loss. Mention the proper equations as per the objective mentioned in the steps. [3]

Q6 (a) The incremental costs (in Rupees/MWh) of operating two generating units are functions of their respective powers P1 and P2 in MW, and are given by [2]
$dC_1/dP_1 = 0.2P_1 + 50$; $dC_2/dP_2 = 0.24P_2 + 40$
Where, $20MW \le P_1 \le 150$ MW; $20MW \le P_2 \le 150MW$.
For a certain load demand, P_1 and P_2 have been chosen such that
dC_1/dP_1 = 76 Rs/MWh and dC_2/dP_2 = 68.8 Rs/MWh. If the generations are rescheduled to minimize the total cost, then calculate new value of P_2.

(b) Determine the incremental cost of received power and the penalty factor of the plant shown in figure below if the incremental cost of production is $dC_1/dP_1 = 0.1P_1 + 3.0$Rs./MWhr .Power Loss 2 MW is incurred when 10 MW is transmitted from generator 1. [3]



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