Registration No :

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B.Tech.
PEL6I102

6^{th} Semester Regular Examination 2017-18
POWER SYSTEM OPERATION & CONTROL
BRANCH : EEE
Time : 3 Hours
Max Marks : 100
Q.CODE : C219
Answer Part-A which is compulsory and any four from Part-B.
The figures in the right hand margin indicate marks.

Part – A (Answer all the questions)

Q1. Answer the following questions: *multiple type or dash fill up type :* **(2 x 10)**

a) What is the unit of transmission loss coefficient?
i) MW ii) $(MW)^{-1}$
iii) Unit less iv) $(MW)^{2}$

b) What will be the penalty factor for a unit, if the generating station is located very close to load centre?
i) Zero ii) Almost equal to unity
iii) The penalty factor is negative iv) The value is very high

c) Which among these is related to the critical clearing time of a fault in a power system?
i) Transient stability limit ii) Steady state stability limit
iii) All of these iv) None of these

d) For economic measure the generators at a power plant operate at _____________.

e) Which among the following methods are highly accurate?
i) Gauss Seidel method ii) Newton Raphson method
iii) Fast decoupled low flow method iv) All of these

f) The initial voltage at all the PQ buses for solving the load flow problem using NR method is __________________.

g) The value of acceleration factor used in the GS method is equal to _____________.

h) The expression of steady state frequency change in two area control system is equal to __________________.

i) A system where generators show a same change in delta when there is a disturbance is known as ______________ system.

j) The equivalent H for two units in a non-coherent system is ________________.

Q2. Answer the following questions: *Short answer type :* **(2 x 10)**

a) Enumerate the benefits of per unit system.

b) Write the equation of Gauss-Siedel Method to solve the power flow method.

c) Write the equality and inequality constraints for solving economic load dispatch problem.

d) A generator has a per unit value of 20 % on a 400 MVA, 100 kV base. What would be the per unit value of the same on a 200 MVA, 150 kV base?

e) Calculate the sparsity in Y bus for a system with 160 bus connected by 380 lines. What will be the change in the sparsity if the no. of lines increases by 20?

f) For a particular system, the Jacobian matrix had a size of 32×32. During the N-R load flow in a particular iteration 2 PV buses changes to PQ bus. Will there be any change in the size of Jacobian? How much?

g) What is the difference between Economic load dispatch & Unit Commitment?

h) Write the economic operation conditions for a system of multiple units with losses.

i) What is the importance of swing equation?

j) At what frequency does the change in rotor angle oscillate when a disturbance occurs? Find an equation to illustrate the same.

Part – B (Answer any four questions)

Q3. a) Explain the reasons behind the different assumptions taken in Decoupled Load flow method. **(10)**

b) A two-bus system is shown in Figure. If a load of 125 MW is transmitted from plant 1 to the load, a loss of 15.625 MW is incurred. Determine the generation schedule and the load demand if the cost of received power is Rs. 24/MWhr. The incremental production costs of the plants are : **(5)**

$$\frac{dF_1}{dP_1} = 0.025\, P_1 + 15$$

$$\frac{dF_2}{dP_2} = 0.05\, P_2 + 20$$

Q4. a) Derive the swing equation of the rotor. Derive the condition of a stability after following a disturbance. **(10)**

b) Draw the LFC loop with implementing EDC. **(5)**

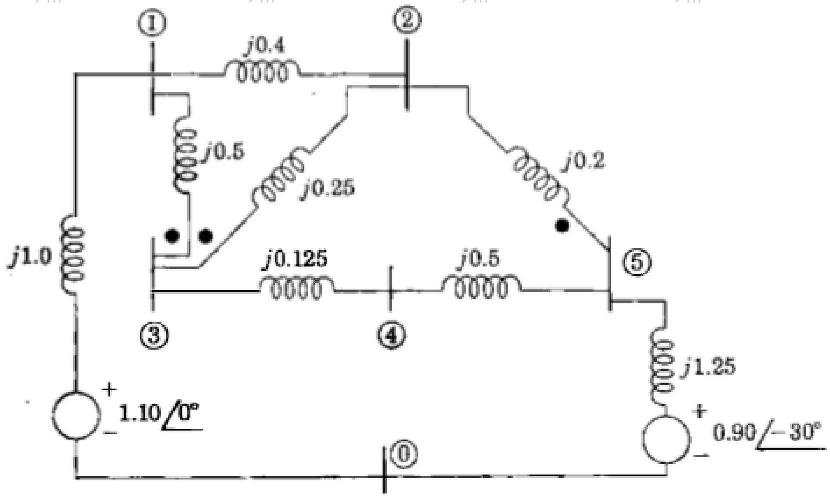
Q5. a) Write down the equations governing the N-R load flow method. Derive the necessary expression of the Jacobian elements in the matrix. **(10)**

b) Derive the loss equation in a transmission system. **(5)**

Q6. a) Explain the Unit commitment method with an example. **(10)**

b) Derive the expressions of critical clearing angle and critical clearing time. **(5)**

Q7. **a)** Using the building block procedure, determine the Y_{bus} for the circuit shown. Assume there is no mutual coupling between any of the branches. **(10)**



b) What is a regulating transformer? What will be the change in the Y_{bus} when a regulating transformer is present? **(5)**

Q8. **a)** Two thermal generating units are operating in parallel at 60 Hz to supply a total load of 700 MW. Unit 1, with a rated output of 600 MW and 4% speed-droop characteristics, supplies 400 MW, and Unit 2, which has a rated output of 500 MW and 5% speed droop, supplies the remaining 300 MWof load. If the total load increases to 800 MW, determine the new loading of each unit and the common frequency change before any supplementary control action occurs. Neglect losses. **(10)**

b) Determine the exact and approximate dynamic response of Δf for a single area system. **(5)**

Q9. **a)** Draw the primary and secondary control loop for a two-area system? What is the ACE in these two area? **(10)**

b) A 60-Hz generator is supplying 60% of Pmax to an infinite bus through a reactive network. A fault occurs which increases the reactance of the network between the generator internal voltage and the infinite bus by 400%. When the fault is cleared, the maximum power that can be delivered is 80% of the original maximum value. Determine the critical clearing angle for the condition described. **(5)**