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UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2017

Program/course: B.Tech PSE **Semester – VII**
Subject: Power System Analysis & Stability **Max. Marks : 100**
Code :PSEG 421 **Duration : 3 Hrs**
No. of page/s:2

SECTION A (20 MARKS)

Attempt all questions. Each question carries 4 marks.

Q1- [CO1] Show that per unit impedance of transformer is same irrespective of side (primary or secondary).

Q2- [CO2] Explain the significance of reactive power limit for a generator bus in case of load flow analysis.

Q3- [CO3] Explain different types of constraints in economic load dispatch.

Q4- [CO4] How the rating of circuit breaker is selected in power system network explain?

Q5- [CO1, CO2] Define bus in the power system. Also explain the significance of infinite bus.

SECTION B (40 MARKS)

Attempt all questions. Each question carries 10 marks.

Q6- [CO2] Explain Gauss Seidel method of load flow analysis.

Q7- [CO1] A 100 MVA, 13.5 kV alternator with solidly grounded neutral has a subtransient reactance of 0.25 p.u. The negative and zero sequence reactances are 0.35 and 0.1 p.u. respectively. A line to line fault occurs at the terminals of an unloaded alternator; determine the fault current and the line-to-line voltages. Neglect resistance.

Q8- [CO3] The fuel inputs per hour of plants 1 and 2 are given as

$F1 = 0.1\ P_1^2 + 20\ P1 + 60$ Rs. per hr

$F2 = 0.2\ P_2^2 + 15\ P2 + 100$ Rs. per hr

Determine the economic operating schedule and the corresponding cost of generation if the maximum and minimum loading on each unit is 150 MW and 25 MW, the demand is 180 MW, and transmission losses are neglected. If the load is equally shared by both the

units, determine the saving obtained by loading the units as per equal incremental production cost.

Q9- [CO4] Derive the swing equation in power system dynamics. Also analyze steady state stability of the power system by the linearization of swing equation.

SECTION C (40 MARKS)

Attempt both questions. Each question carries 20 marks.

Q10. (a)- [CO4] Show that the maximum power can be transferred from sending end to receiving end when the reactance of the line is 1.732 times it's resistance. A 50 Hz generator is delivering 50% of the power that it is capable of delivering through a transmission line to an infinite bus. A fault occurs that increases the reactance between the generator and the infinite bus to 500% of the value before the fault. When the fault is isolated, the maximum power that can be delivered is 75% of the original maximum value. Determine the critical clearing angle for the condition described.

OR

A 50 Hz four-pole turbo-generator rated 10 MVA, 13.5 KV has an inertia constant of H = 9.0 kW-sec/kVA. Determine the K.E. stored in the rotor at synchronous speed. Determine the acceleration if the input less the rotational losses is 25000 HP and the electric power developed is 15000 kW. If the acceleration computed for the generator is constant for a period of 15 cycles, determine the change in torque angle in that period and the r.p.m. at the end of 15 cycles. Assume that the generator is synchronized with a large system and has no accelerating torque before the 15 cycle period begins.

Q11- [CO2] Explain Newton Rhapson Load Flow Method (Polar form) with flow chart.

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UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2017

Program/course: B.Tech Mechatronics **Semester – V**
Subject: Power Electronics & Drives **Max. Marks : 100**
Code :ELEG 341 **Duration : 3 Hrs**
No. of page/s:2

SECTION A (20 MARKS)

Attempt all questions. Each question carries 4 marks.

Q1- [CO1] Derive the equation for converting the per unit impedance expressed in one base to another.

Q2- [CO2] Explain the need of slack bus in a power system.

Q3- [CO3] Explain incremental fuel cost curve.

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Q4- [CO4] Differentiate steady state stability and transient stability in case of power system.

Q5- [CO1] Explain short circuit capacity of a bus.

SECTION B (40 MARKS)

Attempt all questions. Each question carries 10 marks.

Q6- [CO2] Explain the effect of tapped transformer in the nodal admittance matrix (Y Bus).

Q7- [CO1] A 100 MVA, 13.2 kV alternator with solidly grounded neutral has a subtransient reactance of 0.25 p.u. The negative and zero sequence reactances are 0.35 and 0.1 p.u.

respectively. A single line to ground fault occurs at the terminals of an unloaded alternator. Determine the fault current and the line-to-line voltages. Neglect resistance.

Q8- [CO3] The fuel inputs per hour of plants 1 and 2 are given as

$F1 = 0.4\ P_1^2 + 80\ P1 + 240$ Rs. per hr

$F2 = 0.5\ P_2^2 + 60\ P2 + 300$ Rs. per hr

Determine the economic operating schedule and the corresponding cost of generation if the maximum and minimum loading on each unit is 200 MW and 50 MW, the demand is 360 MW, and transmission losses are neglected. If the load is equally shared by both the units, determine the saving obtained by loading the units as per equal incremental production cost.

Q9- [CO4] A 50 Hz synchronous generator is connected to an infinite bus through a line. The p.u. reactances of generator and the line are *j*0.3 p.u. and *j*0.2 p.u. respectively. The generator no load voltage is 1.1 p.u. and that of infinite bus is 1.0 p.u. The inertia constant of the generator is 3 MW-sec/MVA. Determine the frequency of natural oscillations if the generator is loaded to (*i*) 50% and (*ii*) 75% of its maximum power transfer capacity and small perturbation in power is given.

SECTION C (40 MARKS)

Attempt both questions. Each question carries 20 marks.

Q10. (a)- [CO4] A 50 Hz four-pole turbo-generator rated 40 MVA, 13.5 kV has an inertia constant of H = 10.0 kW-sec/kVA. Determine the K.E. stored in the rotor at synchronous speed. Determine the acceleration if the input less the rotational losses is 50000 HP and the electric power developed is 30000 kW. If the acceleration computed for the generator is constant for a period of 10 cycles, determine the change in torque angle in that period and the r.p.m. at the end of 10 cycles. Assume that the generator is synchronized with a large system and has no accelerating torque before the 10 cycle period begins.

OR

Explain equal area criterion method . A 50 Hz generator is delivering 60% of the power that it is capable of delivering through a transmission line to an infinite bus. A fault occurs that increases the reactance between the generator and the infinite bus to 500% of the value before the fault. When the fault is isolated, the maximum power that can be delivered is 75% of the original maximum value. Determine the critical clearing angle for the condition described.

Q11- [CO2] Explain Newton Rhapson Load Flow Method (rectangular form) with flow chart.