Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII(OLD) • EXAMINATION – WINTER 2016

Subject Code: 170807 Date: 18/11/2016

Subject Name: Power System Analysis (Department Elective - I)

Time: 10:30 AM to 01:00 PM Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 (a) What is meant by per unit system? State advantages of per unit system. 07

(b) Explain importance of load flow studies and discuss bus classification in brief for load flow problem. 07

Q.2 (a) Explain the procedure of formulation of YBUS using singular transformation. Derive the necessary equations 07

(b) Discuss the advantages and limitations of Gauss Seidal and Newton Raphson methods. Of this two, which method is generally preferred for solving the load flow problem? 07

OR

(b) A 5 kVA, 400 / 200V, 50 Hz, 1-phase transformer has primary and secondary leakage reactances each of 2.5 Ω. Determine the total reactance in per unit. 07

Q.3 (a) Derive expression for sequence impedances of transmission line and draw their sequence networks. 07

(b) Symmetrical components of phase '*a*' in an unbalanced power system are $V_{a0} = 100\angle 150°$V, $V_{a1} = 150\angle 0°$ V and $V_{a2} = 200\angle -90°$ V. Calculate the phase voltage of '*a*', '*b*' and'*c*'. 07

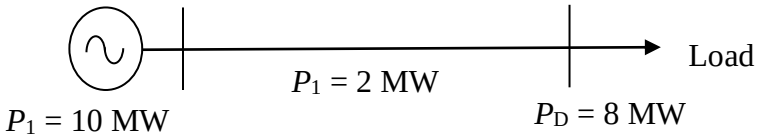
OR

Q.3 (a) With the help of sequence network derive expressions for sequential components for an L-L-G fault on a power system. 07

(b) Determine the incremental cost of received power and the penalty factor of the 07

plant shown in Figure below if the incremental cost of production is

$$\frac{dF_1}{dP_1} = 0.1P_1 + 3.0 \text{ Rs/MWhr}$$



Q.4 (a) (1) Define following (i) Steady-state stability (ii) Transient stability 07
(2) Derive the swing equation from the first principle

(b) A 200 MVA, 11 kv, 50 Hz, 4-cycle 4-pole generator has on inertia constant of 6 MJ/MVA calculate: 07
(a)Find the stored energy in rotor at syn. speed
(b)The M/C is operating at a loud of 120 MW when the load suddenly increases to 160 MW find the rotor retardation, Neglect losses.
(c)The retardation calculated above is maintain for 5 cycle. Find the change in power angle and rotor speed at the end of this period.

OR

Q.4 (a) Explain the reclosure case of equal area criterion. Showing the critical clearing angle (δcr) and angle of reclosure (δrc) when fault in middle of a line of the system. 07

(b) Explain line-to-ground fault. Write terminal conditions at fault location. Derive expression of fault current and draw the connection of sequence networks 07

Q.5 (a) Figure given below shown the system where a three-phase fault is applied at the point P as shown 07

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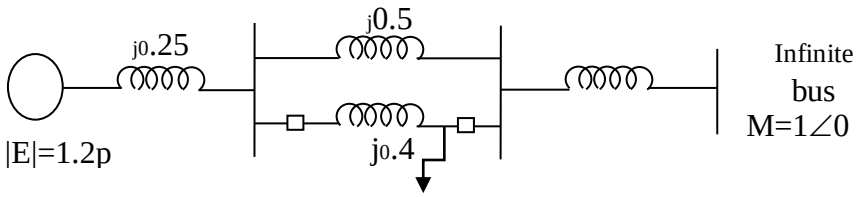

Determine the circuit clearing angle for clearing the fault with simultaneous opening of the breakers 1 and 2. The reactance values of various components are indicated on the figure. The generator is delivering 1.0 pu power at the instant preceding the fault.

(b) What are the conditions to be satisfied before a 3-phase alternator is synchronized to infinite bus bars? 07

OR

Q.5 (a) State and explain the conditions to be satisfied for successful parallel operation of a 3-phase alternator with an infinite bus bar. 07

(b) What is economics dispatch? Derive condition for economics dispatch when generating stations are connected in parallel. 07

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