Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER–IV • EXAMINATION – SUMMER • 2014

Subject Code: X40903 **Date: 21-06-2014**

Subject Name: Power System Analysis and Simulation

Time: 10:30 am - 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.**
4. **Symbols have their usual meanings**
5.

Q.1

(a) State the advantages of per unit system (5)

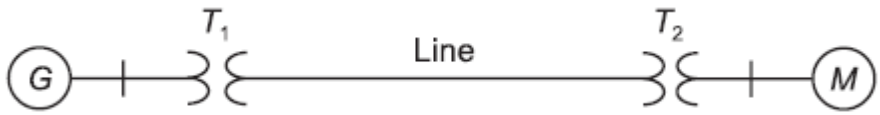
(b) With the help of vector diagram explain the effect of varying excitation of Generator delivering constant power to infinite bus bar (6)

(c) Prove that $1+\alpha+\alpha^2 = 0$ (3)

Q.2

(a) Draw and explain the waveform of short circuit armature current in in synchronous machine on no load. Also explain why $X_d'' < X_d' < X_d$ (7)

(b) Draw the p.u. impedance diagram for the power system shown in fig. Neglect resistance and use a base of 100 MVA, 220 kV in 50Ω line. The ratings of generator, transformer and motor are: (7)



Generator: 40 MVA, 25 kVA, X'' = 20%

Motor: 50 MVA, 11 kV, X'' = 30%

Y-Y transformer T1: 40 MVA, 33/220 kV, = 15%

Y-Δ transformer T2: 30 MVA, 11Δ /220 kV Y, X = 15%

OR

(b) Write a short note on selection of circuit breakers (7)

Q.3

(a) Derive the formula for sequence impedance of transmission lines (7)

(b) Draw zero sequence reactance diagrams for different types of transformer connections (7)

OR

Q.3

(a) Using appropriate interconnection of sequence networks derive the equation for line to ground fault with impedance Z^f (8)

(b) Determine the voltages to neutral Van, Vbn, Vcn in a circuit where $Van_1 = 50$, $Van_2 = j10$, $Van_0 = -10$ (6)

Q.4

(a) A 3-phase synchronous generator rated 25 MVA, 11 kV has positive, negative and zero sequence reactance of 1.0, 0.8 and 0.4 ohms respectively. For a double line to ground fault, find the fault current in phases and the total ground fault current (7)

(b) Why neutral grounding is required? State different methods of neutral earthing and explain resonant earthing (7)

OR

Q.4

(a) Which transmission line can be categorized as medium transmission line? Derive the value of ABCD constants for nominal-T representation (7)

(b) Using the nominal ∏ method find the sending end voltage and voltage regulation of a 250 km, three phase, 50 Hz, transmission line delivering 25 MVA at 0.8 pf lagging to a balanced load at 132 kV. Assume line inductance to be 1.24 mH/km line capacitance to be 0.0094 μF/km and line resistance to be 0.11 Ω/km (7)

Q.5

(a) Discuss factors affecting corona? State the Peek's formula for finding corona loss. (7)

(b) Derive the expression for sending end voltage and current for a long line (7)

OR

Q.5

(a) Derive the expression for refracted and reflected voltage for a line terminated through inductance? (7)

(b) An overhead line with surge impedance of 500Ω bifurcate into two lines of surge impedance 500Ω and 50Ω respectively. If a surge of 25 kV is incident on the overhead line, determine the magnitude of voltage and current which enter the bifurcated lines. (7)

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