UNIVERSITY OF PUNE
[4363]-166
T. E.(Electrical Sem-II)Examination - 2013
POWER SYSTEMS-II
(2008 Pattern)

[Total No. of Questions:12] **[Total No. of Printed Pages :4]**
[Time : 3 Hours] **[Max. Marks : 100]**

Instructions :

*(1) Answer **Q1 or Q2, Q3 or Q4, Q5 or Q6** from section I and **Q7 or Q8, Q9 or Q10, Q11 or Q12** from section II.*
*(2) Answers to the **two sections** should be written in **separate answer-books**.*
(3) Black figures to the right indicate full marks.
(4) Neat diagrams must be drawn wherever necessary.
(5) Use of logarithmic tables, slide rule, Mollier charts, electronics pocket calculator is allowed.
(6) Assume suitable data, if necessary.

SECTION-I

Q1 a) Derive receiving end active and reactive power flow equation using generalized constant [8]

b) A three-phase, 132kV overhead transmission line delivers 50MVA at 132kV and power factor 0.8 lagging at its receiving end. The constants of lines are A=0.98∠3° and B=110∠75°Ω/ph. Find following using analytical method [8]
a) Sending end voltage, active and reactive power
b) Losses and Reactive power absorbed by line

OR

Q2 a) What is the significance of receiving end circle diagram? Explain its Procedure in detail. [8]

b) Explain different types of compensation given to transmission line its significance. [8]

Q3 a) Explain corona phenomenon. Also explain disruptive critical voltage and visual critical voltage in association with corona. [8]

b) A power of 2000MW is required to be transmitted from super thermal power station in Central India over 800km to Delhi. Use 400kV and 750kV [8]

alternatives. The angle between sending and receiving end is maintained at 30°. The average line parameters are given below.

System voltage(kV)	400	750
r(Ω/phase/km)	0.031	0.0136
x(Ω/phase/km)	0.327	0.272

Suggest the number of circuits required and calculate total power loss and loss per km if transmission line is

i) Uncompensated ii) 50% series compensated using capacitor

OR

Q4 a) In three phase overhead line the conductors have each diameter of 30mm and are arranged in the form of an equilateral triangle. Assuming fair weather conditions air density factor is 0.95 and irregularity factor 0.95. Find the minimum spacing between the conductors if the disruptive critical voltage is not to exceed 230kV between lines. Breakdown strength of air may be assumed to be 30kV per cm(peak) [8]

b) Explain advantages of EHV-AC transmission. Also discuss its limitations. [8]

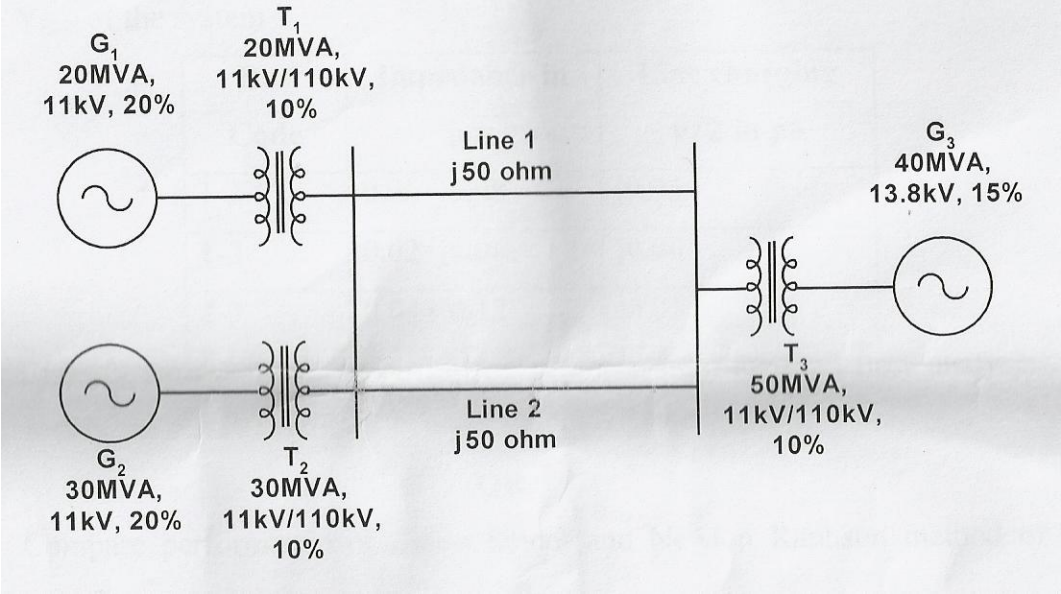
Q5 a) What are advantages and drawbacks of per unit system in power System analysis? [8]

b) Two 11kV, 3-phase 3MVA generators having sub transient reactance of 15% operate in parallel. The generators supply power to a transmission line through 6MVA transformer of ratio 11kV/22kV and having leakage reactance of 5%. Calculate fault current and fault MVA for three phase fault of (i) H.T. side (ii) L.T. side of transformer [10]

OR

Q6 a) Draw oscillogram diagram of symmetrical short circuit current and explain three phase short circuit at terminals of an unloaded alternator in detail. [8]

b) Represent the following power system in equivalent per unit diagram taking base of 20MVA, 11kV on generator G_1. [10]



SECTION-II

Q7 a) Three 6.6kV, 10MVA, 3-phase synchronous generators are connected to a common bus bar. Each machine has x_1=20%, x_2=15% and x_0=6%. If an L-G fault occurs on bus bar, determine fault current if [10]

i) All generator neutrals are solidly grounded. ii) One of the generators neutral is grounded through a resistance of 0.06 p.u. resistance and others are isolated.

b) Draw and explain zero-sequence network for various connection of three phase transformer. [8]

OR

Q8 a) Show that power in three phase circuit can be computed from symmetrical components of voltages and currents. [8]

b) A 15MVA, 6.9kV star connected generator has positive, negative sequence reactances are 25%, 25% and 8% respectively. A reactor with 6% reactance based on generator rating is used to ground the neutral of the generator. Calculate fault current in each phase in case of [10]

i) Line-to-Line fault ii) Double line to ground fault

Q9 a) In a three bus system the bus impedance data is given below. Determine Y_{BUS} of the system [8]

Bus Code	Impedance in p.u.	Line charging y/2 in pu
1-2	0.06+j0.08	j0.05
1-3	0.02+j0.06	j0.06
2-3	0.04+j0.12	j0.05

b) Classify various types of buses in a power system for load flow analysis. Justify the classification [8]

OR

Q10 a) Compare performance of Gauss Seidel and Newton Raphson method of load flow solution [8]

b) Derive static load flow equation for 'n' bus system [8]

Q11 a) Explain the advantages and disadvantages of HVDC transmission system in comparison with HVAC system [8]

b) Explain constant current control and constant ignition control in HVDC transmission system. [8]

OR

Q12 a) Draw single line diagram of HVDC transmission system indicating all components used in it. Also explain all components in detail. [8]

b) Explain different types of HVDC transmission system. Give the name of HVDC transmission line in Maharashtra with its type and specification. [8]