

7E7042

Roll No. (

Total No of Pages: 4

B. Tech. VII Sem. (Main / Back) Exam., Nov. - Dec. - 2018
 Electrical & Electronics Engineering
 7EX2A Power System Analysis
 Common with EE, EX

Time: 3 Hours

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Maximum Marks: 80
 Min. Passing Marks: 26

Instructions to Candidates:

Attempt any five questions, selecting one question from each unit. All questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.

Units of quantities used/calculated must be stated clearly.

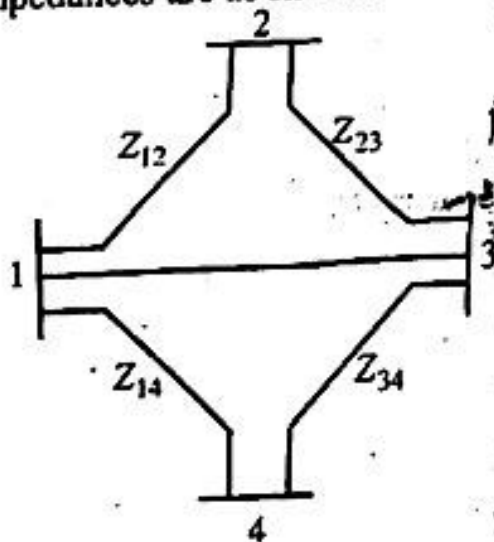
Use of following supporting material is permitted during examination.
 (Mentioned in form No. 205)

1. NIL

2. NIL

UNIT-I

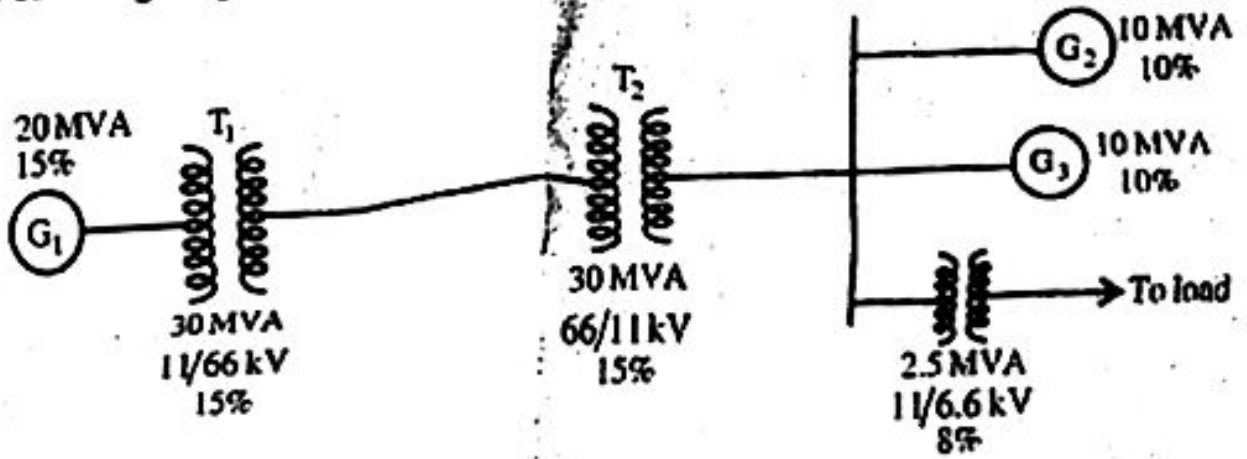
- Q.1 (a) What do you mean by per unit and percentage quantities? What is the need for per unit system? Give the expression for base impedance and per unit impedance referred to new base. Also list the advantages of per unit system. [8]
- (b) For the following figure (given below) determine $[Y_{bus}]$. The series line impedances are as shown - [8]



Line (Bus to Bus)	Impedance (per unit)
1-2 ✓	$0.25 + j 1.0$
1-3 ✓	$0.20 + j 0.8$
1-4 ✓	$0.30 + j 1.2$
2-3	$0.20 + j 0.8$
3-4	$0.15 + j 0.6$

OR

Q.1 (a) For the figure given below, draw the per unit impedance diagram - [8]



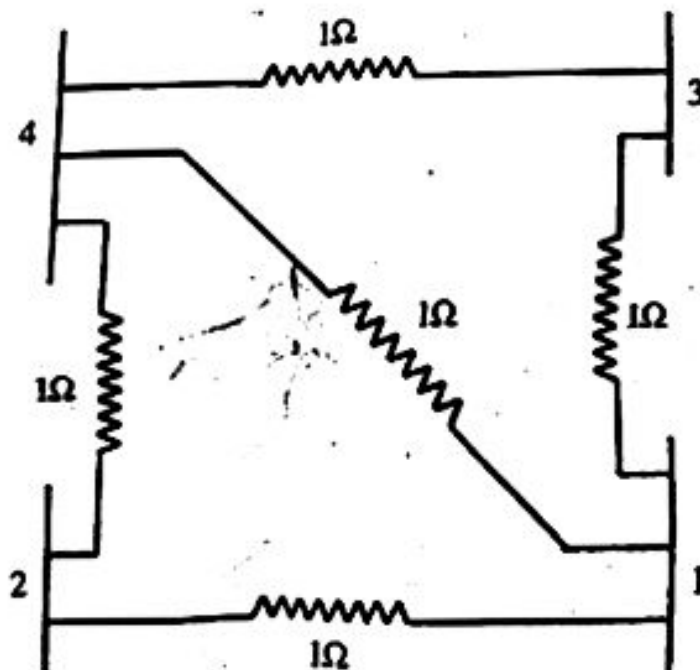
(b) What is the branch admittance and node admittance? What are the advantages of using $[Y_{bus}]$ over $[Z_{bus}]$. Discuss the modification of $[Y_{bus}]$ matrix. [8]

UNIT - II

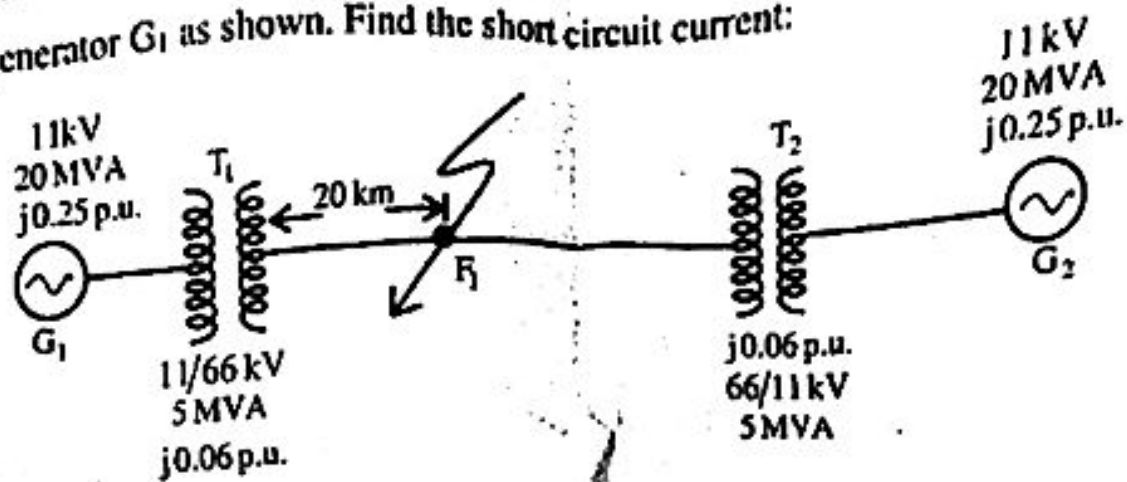
Q.2 (a) Draw and explain the equivalent circuits of a synchronous machine under the following conditions - [8]

- (i) Sub transient condition.
- (ii) Transient condition
- (iii) Steady state condition

(b) Fig. given below shows a four bus system, treating bus 4 as the reference bus, obtain $[Z_{bus}]$: [8]



- OR**
- Q.2 (a) Give a systematic procedure for formulating Z_{bus} deriving all necessary equations? [8]
- (b) Generator G_1 and G_2 are identical and rated 11 kV, 20 MVA and have a transient reactance of 0.25 p.u. at own MVA base. The transformer T_1 and T_2 are also identical and are rated 11/66 kV, 5 MVA and have a reactance of 0.06 p.u. to their own base MVA. The tie line is 50 km long, each conductor has a reactance of 0.848 ohm per kilometer. The 3- ϕ fault is assumed at $F_1 = 20$ km from generator G_1 as shown. Find the short circuit current: [8]



UNIT - III

- Q.3 (a) What are the symmetrical components? Explain clearly with the help of vector diagram the positive, negative and zero sequence quantities. [8]
- (b) Find the sequence, impedance of transmission lines of a power system carrying unbalanced current. [8]

OR

- Q.3 (a) Discuss the sequence impedances of transformers. Also draw the transformer connection and their equivalent sequence network. [8]
- (b) A 30 MVA, 11 kV generator has $Z_1 = Z_2 = j 0.2$ p.u., $Z_0 = j 0.05$ p.u. A line to ground fault occurs on the generator terminals. Find the fault current and line to line voltages during fault conditions. Assume that the generator neutral is solidly grounded and that the generator is operating at no load and at rated voltage at the occurrence of faults. [8]

UNIT- IV

- Q.4 (a) Explain double line to ground fault with the inter connection of sequence network. [8]
- (b) A 50 MVA, 11 kV, 3 - phase alternator was subjected to the different types of faults. The fault current were : 3 - phase fault 1870 amp., line to line fault 2590 amp., single line to ground fault 4130 amp. The alternator neutral is solidly grounded. Find the per unit value of three sequence reactance of the alternator. [8]

OR

- Q.4 (a) Discuss the analysis of unsymmetrical shunt fault using bus impedance matrix method? [8]
- (b) A double line to ground (L - L - G) fault occurs at the terminals of generator. The generator is of 30 MVA, 11 kV and has $Z = Z_2 = j 0.2$ p.u., $Z_0 = j 0.05$ p.u. Determine the line currents, fault current and line to neutral voltages under fault conditions. [8]

UNIT- V

- Q.5 (a) Discuss classification of buses in a power system in brief. [8]
- (b) Explain the fast decoupled method for load flow analysis. [8]

OR

- Q.5 (a) Discuss the Newton Raphson method for load flow study in power system in detail. Derive the equations of various element of Jacobian Matrix. [8]
- (b) Derive the static load flow equations and define clearly the conditions and assumptions made in obtaining these equations. [8]