Reg. No. :

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B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2013.

Sixth Semester

Electrical and Electronics Engineering

EE 1352 — POWER SYSTEM ANALYSIS

(Common to B.E. (Part-Time) Fifth Semester, Regulation 2005)

(Regulation 2004/2007)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is the need for system analysis in the operation of a power system?

2. How are the base values chosen in per unit representation of a power system?

3. How are the buses classified in a power system?

4. What is Jacobian matrix?

5. Explain the following terms:

   (a) momentary current

   (b) interruption current.

6. The Z-bus method is very suitable for fault studies on large systems. Why?

7. What is a sequence network?

8. What are unsymmetrical faults?

9. Define steady state stability.

10. What are the causes of oscillatory and non-oscillatory instabilities in power systems?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Derive the Π model for a transformer with off-nominal tap-ratio. (8)

(ii) Sketch and explain electric power system and mark the voltage level at various points from generator to load. (8)

Or

(b) Describe the modern power system in detail.

12. (a) The parameters of a 4-bus system are as under :

Line No.	Line starting bus	Line ending bus	Line impedance (pu)	Line charging admittance (pu)
1	1	2	0.2 + j0.8	j0.02
2	2	3	0.3 + j0.9	j0.03
3	2	4	0.25 + j1.0	j0.04
4	3	4	0.2 + j0.8	j0.02
5	1	3	0.1 + j0.4	j0.01

Draw the network and find bus admittance matrix. (16)

Or

(b) For a network shown in Fig. 12 (b) form the bus admittance matrix. (16)

$Z_a = j0.6; Z_b = j0.4; Z_c = j0.5 = Z_d; Z_e = j0.2; Z_m = j0.1$. All data are in pu

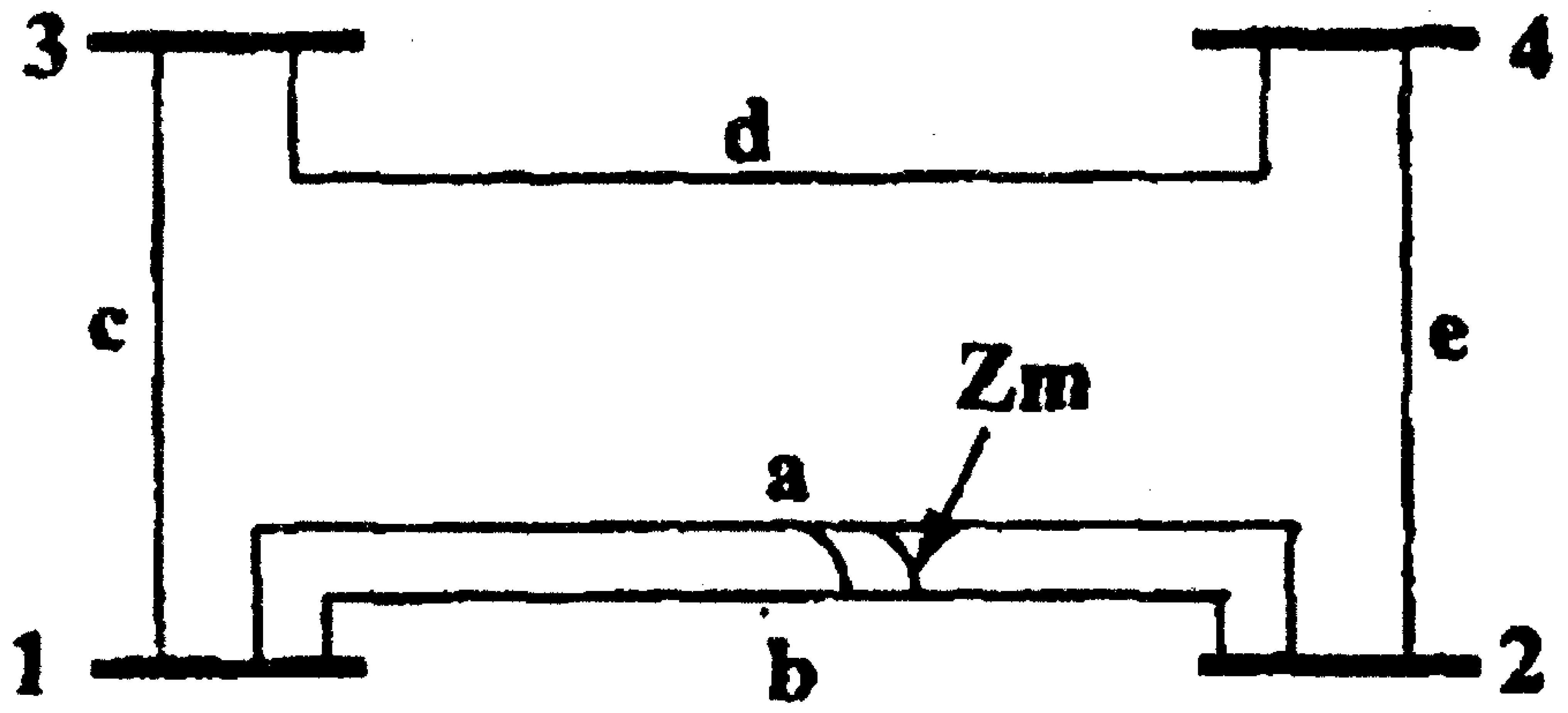

Fig. 12 (b)

13. (a) Explain the step-by-step procedure involved in z-bus building algorithm by considering all possible cases. (16)

Or

(b) Fig. 13 (b) shows a generating station feeding a 132 KV system. Determine the total fault current, fault level and fault current supplied by each alternator for a 3 phase fault at the receiving end bus. The line is 200 km long.

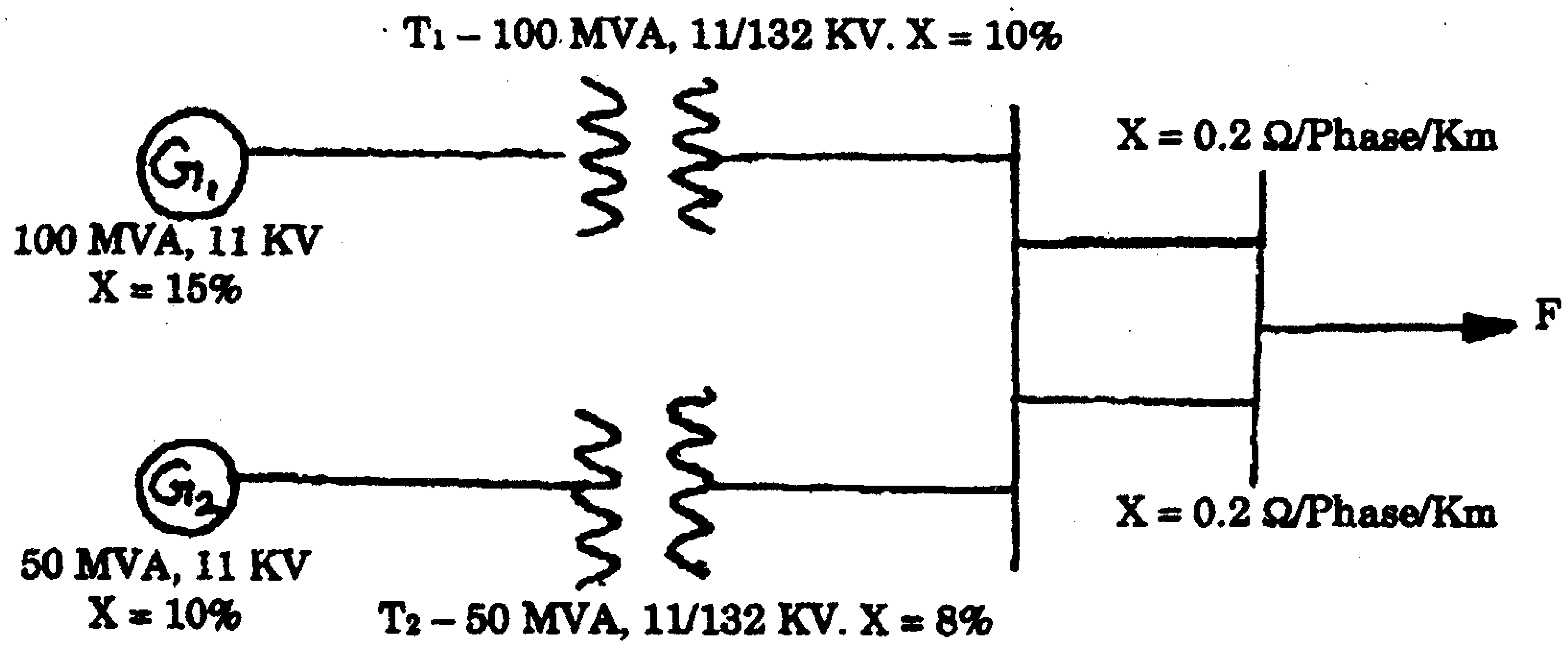

Fig. 13 (b)

14. (a) A single line to ground fault occurs on bus 4 of the system shown in Fig. Q. 14 (a)

(i) Draw the sequence networks and (12)

(ii) Compute the fault current. (4)

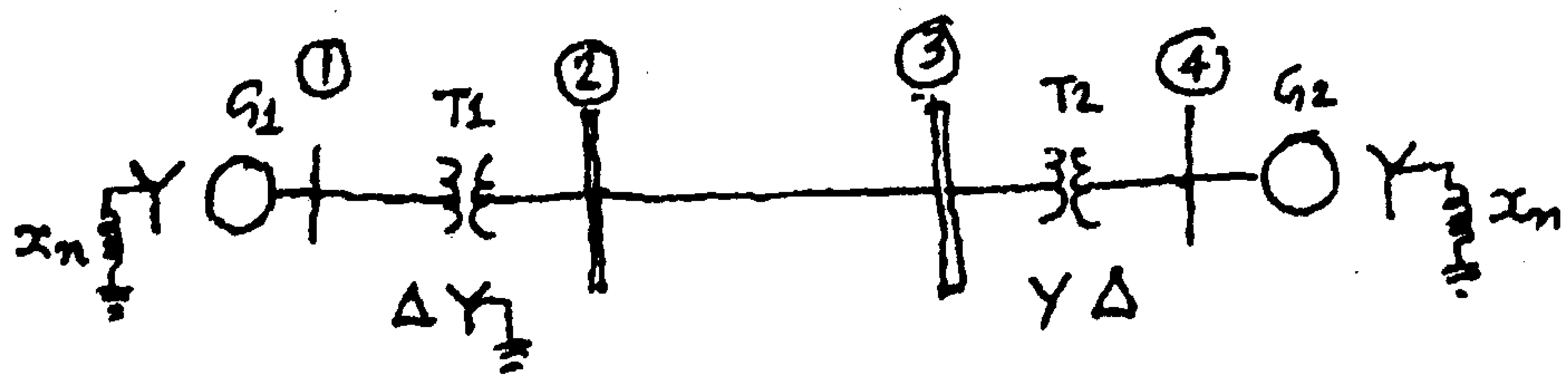

Fig. Q.14 (a)

Gen 1 and 2 : 100 MVA, 20 KV ; X' = X" = 20% ; X_0 = 4% ; X_n = 5%.

Transformer 1 and 2 : 100 MVA, 20/345 KV ; $X_{leakage}$ = 8% on 100 MVA Tr. Line : X' = X" = 15% ; X_0 50% on a base of 100 MVA, 20 KV.

Or

(b) An alternator of negligible resistance, with solidly earthed neutral, having rated voltage at no load condition is subjected to different types of faults at its terminals. The per unit values of the magnitude of the fault currents are

(i)	Three phase fault	:	4.0 p.u.
(ii)	L–G fault	:	4.2857p.u.
(iii)	L–L fault	:	2.8868 p.u.

Determine the p.u. values of the sequence reactances of the machine. (16)

15. (a) State and explain 'equal area criterion' in connection with transient stability analysis. What are the advantages and limitations of this method? (16)

Or

(b) Describe the Runge-Kutta method of solution of swing equation for multi-machine systems. (16)