

# CBCS SCHEME

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15EE71



**Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019**

## Power System Analysis – II

Time: 3 hrs.

Max. Marks: 80

**Note: Answer any FIVE full questions, choosing ONE full question from each module.**

### Module-1

- 1 a. With usual notations, prove that  $Y_{bus} = A^T Y A$  using singular transformation. (06 Marks)
- b. For the power system shown in Fig.Q1(b), obtain  $Y_{bus}$  using singular transformation. (10 Marks)

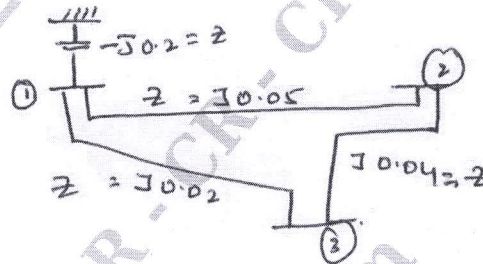


Fig.Q1(b)

OR

- 2 a. What is load flow analysis? Explain how buses are classified to carry out load flow analysis in power system. (06 Marks)
- b. For the sample system of Fig.Q2(b), the generations are connected to all the 4-buses, while loads are at buses 2 and 3. Values of real and reactive powers are listed in Table Q2(b). All buses other than the slack bus are PQ type. (10 Marks)

Bus	P(p.u)	Q(p.u)	V(p.u)	Type of bus
1	-	-	1.040	Ref
2	0.5	-0.2	-	PQ
3	-1.0	0.5	-	PQ
4	0.3	-0.1	-	PQ

Table Q2(b)

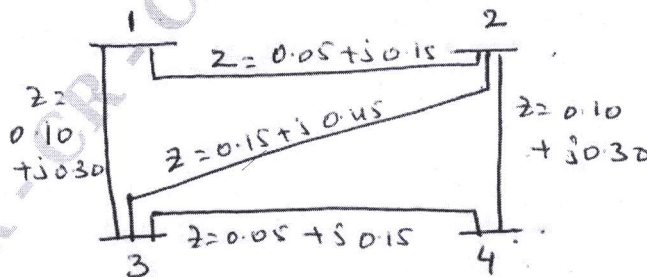


Fig.Q2(b)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

Module-2

- 3 a. Draw the flow-chart of Newton-Raphson method of load flow analysis in polar co-ordinates. (08 Marks)  
 b. Derive expression for all elements of Jacobian matrices on polar form. (08 Marks)

OR

- 4 a. Starting all assumptions, deduce the FDLF model and give the flow-chart. (10 Marks)  
 b. Compare Gauss-Seidal and Newton-Raphson methods of load flow analysis. (06 Marks)

Module-3

- 5 a. Deduce the condition for optimal load disipatch considering transmission losses in a system. (06 Marks)  
 b. The operating cost of  $C_1$  and  $C_2$  in Rs/hr of two generator units each of 100M watt rating of a Thermal plant are,  
 $C_1 = 0.2P_1^2 + 40P_1 + 120$  Rs/hr  
 $C_2 = 0.25P_2^2 + 30P_2 + 150$  Rs/hr.  
 i) Find optimal generation of 2-units for a total demand of 180MW and the corresponding total cost.  
 ii) Saving in Rs/hr in this case, as compare to equal sharing between the two machines. (10 Marks)

OR

- 6 a. With a usual notation, derive the generalized transmission loss formula and B-coefficients. (08 Marks)  
 b. Calculate the loss co-efficient in p.u and  $MW^{-1}$  on a base of SOMUA for the network of Fig.Q6(b) below.

$$I_a = 1.2 - j0.4 ; \quad I_b = 0.4 - j0.2 ; \quad I_c = 0.8 - j0.1 ;$$

$$I_d = 0.8 - j0.2 ; \quad I_e = 1.2 - j0.3$$

$$Z_a = 0.02 + j0.08 ; \quad Z_b = 0.08 + j0.32 ; \quad Z_c = 0.02 + j0.08 ;$$

$$Z_d = 0.03 + j0.12 ; \quad Z_e = 0.03 + j0.12,$$

$$V_{ref} = 1 \angle 0.$$

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(08 Marks)

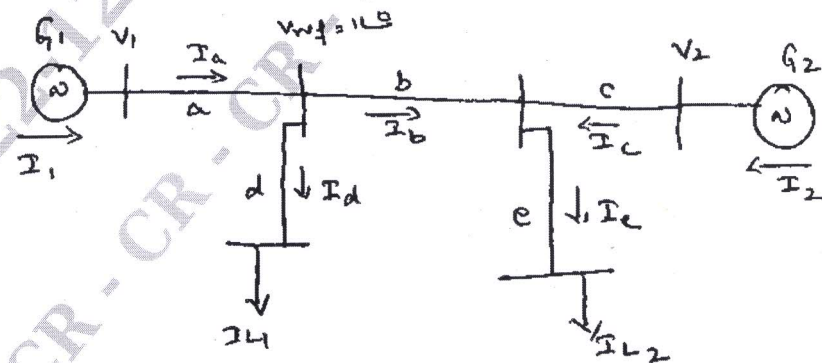


Fig.Q6(b)

**Module-4**

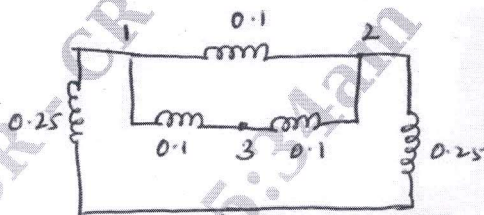
- 7 a. Discuss the problem formulation and solution procedure of optimal scheduling for hydro thermal plant. (10 Marks)  
 b. Draw the flow chart of optimal load flow solution. (06 Marks)

**OR**

- 8 a. Explain power system static security level classification. (08 Marks)  
 b. Define :  
 i) power system reliability  
 ii) power system security. (08 Marks)

**Module-5**

- 9 a. Derive the generalized algorithm for finding the elements of bus – impedance matrix  $Z_{bus}$  when a branch is added to the partial network. (08 Marks)  
 b. For the three-bus network shown in Fig. Q9(b) build  $Z_{bus}$ . (08 Marks)



Ref bus  
Fig. Q9(b)

**OR**

- 10 a. Explain the numerical solution of swing equation. (08 Marks)  
 b. Explain clearly the steps involved in solving power system stability solution of swing equation using Range-Kutta method. (08 Marks)

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