CBCS SCHEME

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17EE71

Seventh Semester B.E. Degree Examination, July/August 2022
Power System Analysis – II

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Define the following terms with an example:
(i) Oriented graph
(ii) Tree
(iii) Co-tree **(06 Marks)**

b. Derive the power flow equations of a power system. **(06 Marks)**

c. Determine the bus admittance matrix for the system by singular transformation method. Take node 0 as reference.

Line No.	1	2	3	4	5
Bus code (p – q)	0 – 1	1 – 2	2 – 3	3 – 0	2 – 0
Admittance in PU	1.4	1.6	2.4	2.0	1.8

(08 Marks)

OR

2 a. What is primitive network? Obtain the impedance and admittance form of primitive network. **(06 Marks)**

b. Explain how buses are classified for load flow study. **(06 Marks)**

c. For the system shown in Fig.Q2(c), calculate the voltages of bus 2 and 3 at the end of first iteration using Gauss-Seidal method.

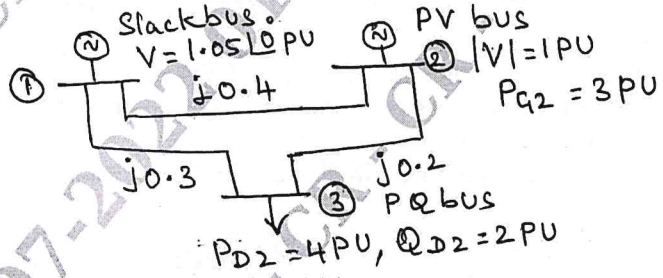

Fig.Q2(c) **(08 Marks)**

Module-2

3 a. Draw the flow-chart of Newton-Raphson method of load flow analysis in polar coordinates. Write the equations to find Jacobian matrix elements. **(10 Marks)**

b. Compare Newton-Raphson and Fast decoupled load flow methods with different parameters. **(10 Marks)**

OR

4 a. Deduce fast decoupled load flow model by clearly stating all the assumptions. **(10 Marks)**

b. Explain how the voltage profile is controlled by synchronous generators, VAR generators and regulating transformers. **(10 Marks)**

Module-3

5 a. Explain : (i) Input-output curve (ii) Heat rate curve (iii) Incremental fuel cost curve related to thermal plant. **(06 Marks)**

b. A two bus system is shown in Fig.Q5(b). If 100 MW is transmitted from plant 1 to the load, a transmission loss of 10 MW is incurred. Find the required generation for each plant and the power received by the load, when the system incremental cost is Rs.25/MWhr. The incremental fuel cost of the two plants are,

$$\frac{dc_1}{dP_{G_1}} = 0.02P_{G_1} + 16 \text{ Rs/MWhr} \; ; \quad \frac{dc_2}{dP_{G_2}} = 0.04P_{G_2} + 20 \text{ Rs/MWhr}$$

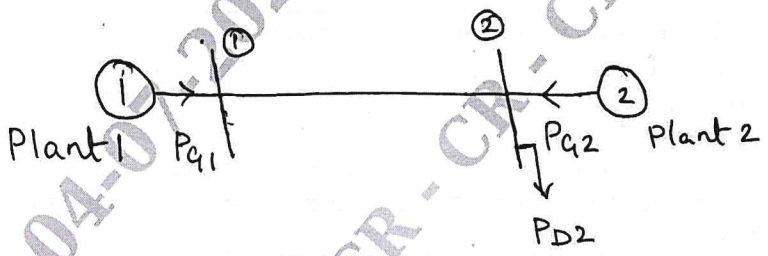

Fig.Q5(b) **(08 Marks)**

c. With the help of two state model of generator, derive the probability of a unit being in UP and DOWN state. **(06 Marks)**

OR

6 a. State unit commitment problem. In brief, explain dynamic programming method of unit commitment solution. **(06 Marks)**

b. The fuel inputs per hour of plants 1 and 2 are given as,

$F_1 = 0.2P_1^2 + 40P_1 + 120$ Rs/hr ; $F_2 = 0.25P_2^2 + 30P_2 + 150$ Rs/hr

Determine the economic operating schedule and the corresponding cost of generation, if the maximum and minimum loading of each unit is 100 MW and 25 MW. The demand is 180 MW.

(i) If the load is equally shared by both the units

(ii) Determine the saving obtained by loading the units as per equal incremental production cost. **(08 Marks)**

c. Deduce the condition for optimal load dispatch considering losses in the system. **(06 Marks)**

Module-4

7 a. Write the algorithm for solving the optimal load flow problem. **(08 Marks)**

b. Explain the power system security levels with a block diagram. **(06 Marks)**

c. Explain the following related to power system reliability:

(i) System Loss of Load Probability (LOLP)

(ii) Frequency and duration of state **(06 Marks)**

OR

8 a. Explain the hydrothermal scheduling problem with the mathematical formula and solution technique. **(08 Marks)**

b. With the help of Bath-tub curve, explain different failure in a system. **(06 Marks)**

c. Explain the indirect method of contingency selection. **(06 Marks)**

Module-5

9 a. Explain the algorithm for solving swing equation using Runge-Kutta order-2 method. **(10 Marks)**

b. For the power system shown in Fig.Q9(b), the reactances are given in PU. A solid three phase fault occurs on bus-3. Calculate:
(i) Fault current
(ii) Bus voltages
(iii) Fault current in lines 1 – 2 and 1 – 3.

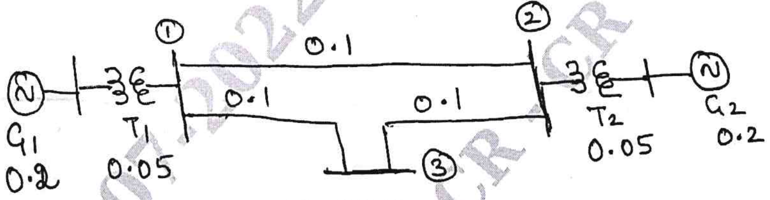

Fig.Q9(b) **(10 Marks)**

OR

10 a. Explain point by point method of solving swing equation. **(10 Marks)**

b. Find the bus impedance matrix for the system whose reactance diagram is shown in Fig.Q10(b) using bus building algorithm. All reactance are in PU.

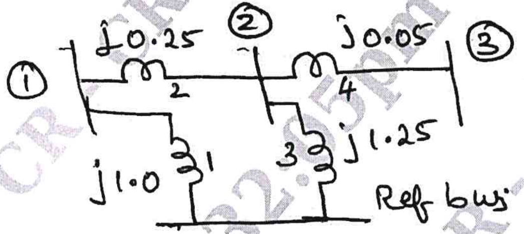

Fig.Q10(b) **(10 Marks)**

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