Ex/EE/PE/B/T/414E/2024(S)

Bachelor of Electrical Engineering, 2024

4th year 1st Semester Supplementary Examination

Advanced Power System analysis

Time: 3 hours Full marks: 100

50 marks for each part

Use separate answer scripts for each part

Part I

Answer any three Questions:

Two marks reserved for well organized answers

1. Discuss the necessity of classifying the Power System buses for Load flow analysis.

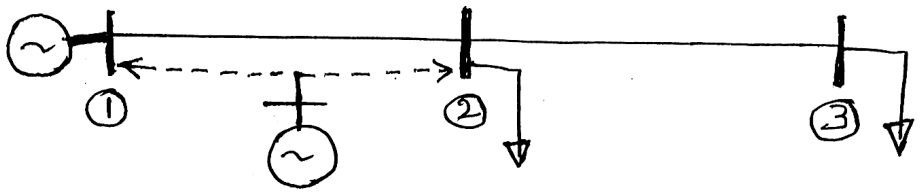
How the treatment of the PQ buses is different from that of the PV buses in load flow algorithms? (5 + 11).

2. Explain, how the Jacobean matrix elements are made constant in the Fast Decoupled load flow.

Compare the Newton Raphson and Fast Decoupled load flow in respect of computational burden, convergence and accuracy. (12 + 4)

3.Derive the condition for economic dispatch in Power System considering the effect of transmission loss.

The Power system shown in the figure is anticipating a load growth at bus no. 3 for which an identical generator as the existing one is decided to be installed either at bus 2 or at bus 1. Comment on the power output of the generators and the transmission loss in the above mentioned cases. (10+6)



4.Discuss the importance of solving the Unit Commitment problem. How is it different from the Economic dispatch problem?

Also discuss he costs and constraints to be considered in the Unit commitment problem.(4+2+10)

5.How a single area power system is different from a two area power system?

How a tie line is modelled for frequency control analysis?

Justify the selection of the Area Control error for the frequency control of two area Power System. (3+7+6)

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B.E. ELE. ENGG. 4TH YEAR 1ST SEMESTER SUPPLEMENTARY EXAMINATION 2024

ADVANCED POWER SYSTEM ANALYSIS

Time: Three hours Full Marks: 100

(50 marks for each part)
Use separate answer script for each part.

PART II
Answer **any two** questions.

1.(a) Clearly explain why load flow equations used for steady-state analysis of power systems require to be modified when they are used for transient stability study. Also write down the modifications required and the load flow equations resulting due to those modifications. (10)

(b) Write down the computational steps (or show the flow chart) necessary for solution of classical transient stability problem using modified Euler method. (15)

2.(a) Explain clearly the limitations of classical (second order) model of synchronous machine for long duration transient stability study. What model should be used to overcome those limitations. Draw the vector diagram for this improved model showing the various components of voltages and currents in the armature circuit and establish relations between them. (10)

(b) With the help of a neat sketch show the transfer function block diagram of the IEEE-Type I model of synchronous machine excitation system. Mention the significance of all the blocks and derive the relevant differential equation model. (8)

(c) Write down the steps required to compute the initial conditions required for transient stability study with the machine model and the excitation system model suggested above. (7)

3.(a) Explain the advantages of using sequence component quantities over phase quantities for analysis of power system with unbalanced loading. Derive the general equation for fault current in a power system in sequence component quantities when fault impedance matrix is available and when not. There from derive the expression for fault current in phase quantities for a 3-phase to ground fault. Clearly mention the assumptions taken during this derivation. (17)

(b) A power system network is augmented by adding a new branch between two existing buses. Derive the Z_{BUS} matrix of the augmented network. (8)