P8481

Oct-22/BE/Insem-67
B.E. (Electrical Engineering)
POWER SYSTEM OPERATION AND CONTROL
(2019 Pattern) (Semester - VII) (403141)

Time : 1 Hour]   *[Max. Marks : 30*

Instructions to the candidates:

1) *Answer Q1 or Q2, Q3 or Q4.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*
4) *Assume suitable data, if necessary.*
5) *Use of non-programmable calculator is allowed.*

Q1) a) State whether the following statements are true or false with appropriate justification: **[3]**

    i) The equal area criteria is the graphical method used to determine steady-state stability analysis.

    ii) The steady state stability limit (the maximum power that can be transmitted without loss of stability) is 120°.

b) Sketch the power angle curve for the application of equal area criteria with a sudden increase in mechanical input. Show accelerating and deaccelerating areas in it. Hence, write the mathematical expressions associated with accelerating and deaccelerating areas and maximum load angle (δ_{max}). **[5]**

c) A 50 Hz generator is connected to an infinite bus. A fault occurs in the system and it is cleared after a small interval of time. The initial mechanical input is 0.8 pu. The power angle equations at different conditions are as follows: **[7]**

Pre-fault: $P_{eI} = 1.8 \times \sin(\delta)$

During the fault: $P_{eII} = 0.5 \times \sin(\delta)$

Post-fault: $P_{eIII} = 1.3 \times \sin(\delta)$

Determine the critical clearing angle (δ_{cr}) by using Equal Area Criteria. Hence, draw the power angle curve for this situation.

OR

Q2) a) Define and explain : **[3]**
   i)   Steady-state stability
   ii) Transient Stability

   b) List the methods to improve the transient stability. Explain any two. **[5]**

   c) In the system shown in fig, below, a three-phase fault occurs in the middle of one of the transmission lines (shown by point P). The fault will be cleared by the simultaneous opening of circuit breakers at both ends. If the initial mechanical power is 0.8 pu, determine the power transfer equation for pre-fault, during a fault, and post-fault conditions. **[7]**
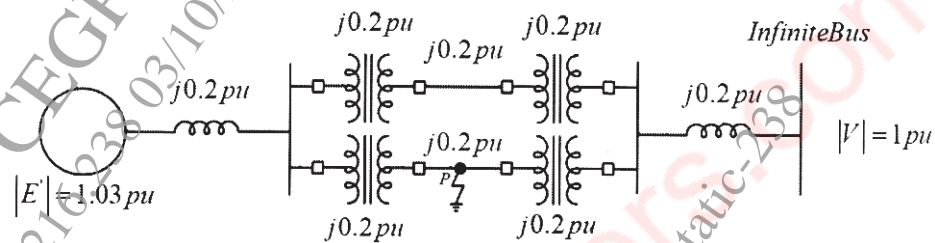
Q3) a) What is the necessity of reactive power control? **[3]**

   b) Explain the working principle and circuit diagram of SSSC. **[5]**

   c) What is the loading capability curve of a synchronous generator? Sketch the loading capability curve of a synchronous generator. Hence explain armature current limit. **[7]**

OR

Q4) a) Draw the diagram of STATCOM. **[3]**

   b) Enlist the reactive power compensation devices. Explain any two. **[5]**

   c) Explain the working principle, circuit diagram, and V-I characteristics of TCSC. Mention any two applications of it. **[7]**

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