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Question Paper Code : 90490

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022.

Sixth Semester

Electrical and Electronics Engineering

EE 8003 — POWER SYSTEMS STABILITY

(Regulations 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the assumptions made in solving swing equation?
2. Define swing curve.
3. List the merits of small signal stability.
4. Define participation factor.
5. List the advantages of Runge-Kutta method of transient stability analysis.
6. Describe transient stability limit.
7. Write the relation between energy and power.
8. What is Static VAR Switch?
9. Define frequency based stabilizers.
10. List the merits of dynamic braking.

PART B — (5 × 13 = 65 marks)

11. (a) A 50-Hz, 100-MVA, four-pole, synchronous generator has an inertia constant of 3.5s and is supplying 0.16 Pu power on a system base of 500 MVA. The input to the generator is increased to 0.18 pu. Determine (i) the kinetic energy stored in the moving parts of the generator and (ii) the acceleration of the generator. If the acceleration continues for 7.5 cycles, calculate (iii) the change in rotor angle and (iv) the speed in rpm at the end of the acceleration.

Or

(b) Describe the modelling of synchronous machine for stability studies (classical model).

12. (a) Explain the concept of state and draw the block diagram of the state space representation.

Or

(b) The moment of inertia of a 250-MVA generator is 75000 kgm². If the operating frequency is 50 Hz and the generator has two poles, compute (i) kinetic energy of the rotating parts. (ii) H, and (iii) M. (5+4+4)

13. (a) Explain the modified Euler method of analyzing multi machine power system for stability, with neat flow chart.

Or

(b) A three phase fault is applied at the point P as shown below in Fig. 13 (b) Find the critical clearing angle for clearing the fault with simultaneous opening of the breakers 1 and 2. The reactance values of various components are indicated in the diagram. The generator is delivering 1.0 p.u. power at the instant preceding the fault.

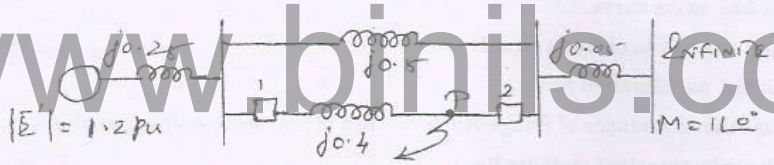

Fig. 13 (b)

14. (a) Explain the voltage collapse phenomenon with the help of P-V curves.

Or

(b) Discuss the characteristics of reactive power compensating devices.

15. (a) Discuss the role of power system stabilizers for the enhancement of small signal stability.

Or

(b) Draw the schematic diagrams of P omega stabilizer and delta omega stabilizer and compare their properties and operation in detail.

PART C — (1 × 15 = 15 marks)

16. (a) Two synchronous machines are connected through three phase transformers to the transmission line. The ratings are reactance's of the machines and transformers are Machine 1 and 2: 60MVA, 25KV, X"=X1=X2=12%, X0=4%, Xn=5% Transformers T1& T2: 75MVA, 25/220KV, X=6% Both transformers are solidly grounded on two sides on a chosen base of 75MVA, 220KV in the transmission line circuit. The reactance's are X1=X2=13% and X0=42%. The system is operating at nominal voltage without pre fault currents when a bolted single line to ground fault occurs on phase A at bus 2. Determine the sub transient current to ground at the fault.

Or

(b) Discuss in detail, enhancement of voltage stability with various types of localized reactive power support.

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