Code: 13A02802 **R13**

B.Tech IV Year II Semester (R13) Advanced Supplementary Examinations July 2017

POWER SYSTEM DYNAMICS & CONTROL

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

PART - A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) What do you mean by global stability?
(b) Define small signal stability.
(c) List out the assumptions made in developing mathematical equations of synchronous machine.
(d) Draw and explain the steady state equivalent circuit of synchronous machine with saliency neglected.
(e) What is natural impedance loading of the line?
(f) Explain undesirable effects of heat produced by current flow in transmission lines.
(g) How the induction machine characteristics differ from synchronous machine characteristics?
(h) Draw the functional block diagram of a synchronous generator excitation control system.
(i) Describe the transient stability phenomenon with illustrative example.
(j) Define voltage stability.

PART - B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT - I

2 (a) Explain the classification of power system stability.
(b) Explain the relationship between reliability, security and stability.

OR

3 (a) Derive the dynamics of synchronous machine.
(b) A 50 Hz, four pole generators rated 100 mVA, 11 kV has an inertia constant of 8.0 mJ/mVA. (i) Find the stored energy in the rotor at synchronous speed. (ii) If the mechanical input is suddenly raised to 80 mW for an electrical load of 50 mW, find rotor acceleration, neglecting mechanical and electrical losses.

UNIT - II

4 (a) Derive the rotor circuit equations of the synchronous machine.
(b) Explain about dqo transformation.

OR

5 (a) Explain how dc offset is eliminated in short circuit currents.
(b) Explain about various tests used to determine synchronous machine parameters.

UNIT - III

6 (a) Explain basic approaches to the determination of system load characteristics.
(b) Draw and explain the equivalent circuit of three-plane induction machine with necessary equations.

OR

7 (a) Explain about dynamic load models.
(b) Explain the power transfer between active sources when $\delta = 0$ and $\delta \neq 0$ with the help of phasor diagrams.

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UNIT - IV

8 (a) Describe the effect of load characteristics on voltage stability.

(b) Give the classification of voltage stability.

OR

9 A 20 mVA, 50 Hz generator delivers 18 mW over a double circuit line to an infinite bus. The generator has kinetic energy of 2.52 mJ/mVA at rated speed. The generator transient reactance is $X_d'' = 0.35$ pu. Each transmission circuit has R = 0 and a reactance of 0.2 pu on a 20 mVA base. $|E^{I}| = 1.1\ pu$ and $V = 1.0\angle 0°$. A 3-phase short circuit occurs at the midpoint of one of the transmission lines. Plot swing curves with fault cleared by simultaneous opening of breakers at both ends of the line at 6.25 cycles after the occurrence of fault.

UNIT - V

10 Explain the transient stability enhancement in detail.

OR

11 Draw and explain the block diagram of thyristor excitation system with PSS.

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