

7E 7045

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B.Tech. VII Semester(Main/Back) Examination, Dec. - 2015

Electrical & Electronics Engineering

7EX5A Power System Engineering

EE,EX

Time : 3 Hours

Maximum Marks : 80

Min. Passing Marks : 24

Instructions to Candidates:

Attempt any five questions, selecting one question from each unit. All questions carry equal marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly).

Unit - I

1. a) Draw input output, heat rate and incremental rate curves of thermal generating units. (8)
- b) The fuel costs of two thermal units are given by $C_1 = C_1(P_{G1}) = 1.0 + 25P_{G1} + 0.2P_{G1}^2$ Rs/hr and $C_2 = C_2(P_{G2}) = 1.5 + 35P_{G2} + 0.2P_{G2}^2$ Rs/hr. If the total demand on the generators is 200MW, find the economic load scheduling of the two units. (8)

OR

1. a) Determine the incremental transmission loss formula for a system having three generators. (8)
- b) Write all the constraints considered in solving the unit commitment problem. (8)

Unit - II

2. a) A 50 Hz, 100 MVA, 4-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. (8)
- b) Find out equation of synchronizing power coefficient. How it affects the stability? (8)

OR

2. a) Derive the equation of motion of the rotor of a synchronous generator by the laws of rotation. (8)
- b) Write power angle equations and draw power angle curves for steady state and transient conditions. Give steady state stability limits. (8)

Unit - III

3. a) What are the assumptions commonly made in stability studies? (7)
- b) Determine the stability limit for step change in mechanical power input to the machine, using equal area criterion. (9)

OR

3. a) Write possible techniques available for improvement of transient stability. (8)
- b) Find out the equation of critical fault clearing time, for a system having sudden decrease in power output due to three phase fault on generator bus, if generator is feeding power to the infinite bus through a line. (8)

Unit - IV

4. a) What is the effect of varying excitation of a synchronous generator over its stiffness? Explain by curves. (8)
- b) Write advantages and problems of inter-connected power system. (8)

OR

4. a) Draw the block diagram and explain the brushless excitation system. (8)
- b) What is the need of reserve capacity of power stations? Explain spinning and maintenance reserves. (8)

Unit - V

5. a) Describe one scheme of series compensation of transmission lines. What are the problems of series compensation. (8)
- b) Describe voltage stability analysis using P - V curves. (8)

OR

5. a) What are the requirements of phase angle control? Explain working of phase shifting transformer. (8)
- b) Explain power system security analysis. (8)