QP Code : 31250

Duration : 3 Hours **Total Marks : 80**

Note :1. **Q. 1 is compulsory.**
2. Solve any 3 questions out of remaining questions.
3. Assume suitable data if necessary.

Q.1 (20)

a) What are the assumptions made in transient stability studies?
b) What is area control error?
c) What are the assumptions made in Fast decoupled load flow studies?
d) Draw and explain heat rate curve and input output curve.

Q.2a) Derive the swing equation for a synchronous machine that describes the rotor dynamics. (10)

Q.2b) Consider a power system where a single machine tied to an infinite bus through two parallel lines. Derive the critical clearing angle for stability if a sudden short circuit occurs at the midpoint of one of the parallel lines. The maximum power transmitted under pre fault, during fault and post fault is P_{maxI}, P_{maxII}, P_{maxIII}. (10)

Q.3a) in a two bus power system, bus no. 1 is a slak bus with $V_1 = 1\angle 0$pu and bus no. 2 is a load bus with demanded power of $S_D = 2.8+j0.6$pu. The transmission line connected between the buses 1 and 2 has impedance of $Z = 0.02+j0.04$pu. Using Gauss Seidal method, calculate V_2 at the end of second iteration. (10)

Q.3 b) Compare GS and NR method of load flow studies. (10)

Q.4a) a system consists of two plants connected by a tie line and a load is located at plant 2. When 100MW are transmitted from plant 1, a loss of 10MW takes place on the tie line. Determine the generation schedule at both the plants and power received by the load when λ for the system is Rs. 25per MWhr and the incremental fuel costs (IC) are given by the equations below:

$IC_1 = 0.03P_1 + 17$ Rs / MWhr

$IC_2 = 0.06P_2 + 19$ Rs / MWhr (10)

[TURN OVER]

Q.4b) Derive the expression for the exact coordination equation. (10)

Q.5a) Two generators rated 200 and 400MW are operating in parallel. The droop characteristics of their governors are 4%and 5% resp. from no load to full load .Assuming those generators are operating at 50 Hz at no load, how a load of 600MW would be shared between two units. What will be the system frequency at this load? If load is now suddenly reduced by 200MW what will be now system frequency and load shared by each unit at this load. Assume free governor operation. (10)

Q.5b) Explain dynamic response of load frequency controller with and without integral control action (10)

Q. 6 Write short notes on (any three) (20)

a. Power pool and transactions
b. Optimal Unit commitment and reliability considerations.
c. AGC in restructured power system
d. P-V curve for voltage stability analysis
