Exam.Code:1017
Sub. Code: 7780

1078

M.E. Electrical Engineering (Power Systems)
First Semester
EE-8102: Power System Operation and Control

Time allowed: 3 Hours Max. Marks: 50

NOTE: Attempt any five questions. Missing data (if any) can be appropriately assumed.

x-x-x

Q1. A) **A power station has the following load:** (10)
Residential light load:
maximum load is 1000 KW, Load factor is 20%, diversity between consumers is 1.3.
Commercial load:
maximum load is 2000 KW, load factor is 30%, diversity between consumers is 1.1.
industrial load:
maximum demand of 5000 KW, load factor of 80%, diversity between consumers is 1.2.
overall diversity factor may be taken as 1.4.
Find **(i)** maximum demand on the system, **(ii)** daily energy consumption of each type of load and total energy consumption, **(iii)** connected load of each type, assuming the demand factor of each is 100%.

Q2. Define the load forecasting and explain in detail all the types of load forecasting used in power system. (10)

Q3. A) An uncontrolled isolated power system has the following parameters: rated output = 350 MW, Regulation = 0.06, Inertia constant = 5, Turbine time constant = 0.6 sec, Governor time constant = 0.3 sec, normal frequency = 50 Hz. The load varies by 0.7 percent for a 1 percent change in frequency. Determine the steady state frequency deviation in Hz for a load change of 50 MW. (05)

B) Develop the block diagram model of uncontrolled two area load frequency control system and explain the salient features under static conditions. (05)

Q4. A load is to be supplied from hydroplane and steam system whose characteristic are as follows: (10)

Equivalent steam system:
$H=500+8.0P_s-0.0016P_s^2$ MBtu/h
Fuel cost= 1.15 Rs/MBtu
$150MW \leq P_s \leq 1500MW$

Hydro plant:
$q=330+4.97\ P_H$ Acre-ft/h
$0 \leq P_H \leq 1000MW$
$Q=5300+12(P_H-1000)+ 0.05(P_H-1000)^2$ Acre-ft/h
$1000<P_H<1100MW$

Load Patterns:
first day
2400-200=1200MW
1200-400=1500MW
Second day
2400-1200=1100MW
1200-2400=1800MW
Third day
2400-1200=950MW
1290-2400=1300MW

Hydro-reservior:
1. 100000 acre-ft at the start.
2. Must have 60000 acre-ft at the end of schedule.
3.reservior volume is limited as follws:
60000 acre-ft$\leq V \leq$120000 acre-ft
4. There is a constant inflow into the reservoir of 2000 acre-ft/h over the entire 3 day period.

Electric losses are $0.00008P_H^2$
Find an optimal hydrothermal scheduling using the gradient technique.

P.T.O

Q5. A) Derive the coordination equation with losses neglected.

B) Discuss the short term hydro-thermal scheduling problems and discuss how the problem is solved by Lamda– Gamma and iteration method.

Q6. Consider three thermal generating units running described below

Unit Data	Minimum (MW)	Maximum (MW)	Fuel cost (Rs/MBtu)
$H_1(P_1) = 225 + 8.4P_1 + 0.0025P_1^2$	45	350	0.80
$H_2(P_2) = 729 + 6.3P_2 + 0.0081P_2^2$	45	350	1.02
$H_3(P_3) = 400 + 7.5P_3 + 0.0025P_3^2$	47.5	350	090

Calculate the economic dispatch schedules by using gradient method for the demand of 500MW initial conditions on three units are $P_1=P_3=100$MW and $P_2=300$MW.

Q7. Write short notes on
a) Gradient search techniques
b) Load frequency control
c)

Q8. A) What is EMS? What are its major functions in power system operation and control?

B) Explain the different operating states of power system with state transition diagram.

x-x-x