Roll No. | | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 08

M.Tech. (Power System) (2013 & Onwards) (Sem.–2)

POWER SYSTEM OPERATION AND CONTROL

Subject Code : MTPS-201

Paper ID : [A2513]

Time : 3 Hrs. Max. Marks : 100

INSTRUCTION TO CANDIDATES :

1. **Attempt any FIVE questions out of EIGHT questions.**
2. **Each question carries TWENTY marks.**
3. **Assume any missing data appropriately.**

1. a) Explain input-Output Characteristic of a steam turbine. State the difference between fuels of Higher Heating Value and Lower Heating Value. Any uniform standard exists, explain in brief. (10)

   b) Explain economic dispatch of electric power problem. How the optimum dispatch schedule is achieved, explain the method. (10)

2. a) What are drawbacks of lambda search technique? Explain any method of optimization where lambda search technique is not suitable. (8)

   b) Three on-line generating units have the following characteristics :

   Unit 1 : $H_1 = 312.5 + 8.25\ P_1 + 0.005\ P_1^2$ MBtu/ h ;

   $50 \geq P_1 \geq 250$ MW and fuel cost =1.05Rs/MBtu

   Unit 2 : $H_2 = 112.5 + 8.25\ P_2 + 0.005\ P_2^2$ MBtu/ h

   $5 \geq P_2 \geq 150$ MW and fuel cost =1.217Rs/MBtu

   Unit 3 : $H_3 = 50.0 + 8.25\ P_3 + 0.005\ P_3^2$ MBtu/ h

   $15 \geq P_3 \geq 100$ MW and fuel cost =1.1831 Rs/MBtu

   The [B] -matrix of the system with B_{i0} and B_{00} neglected, is given by

$$B_{ij} \begin{bmatrix} 1.36255 & 0.1754 & 1.8394 \\ 0.1754 & 1.5448 & 2.82765 \\ 1.8394 & 2.82765 & 16.147 \end{bmatrix} \times 10^{-4}$$

   Find optimum dispatch for a total generation of 200MW. Also calculate the losses using the loss formula. (12)

3. a) Explain priority list method of unit commitment through a suitable example. (10)

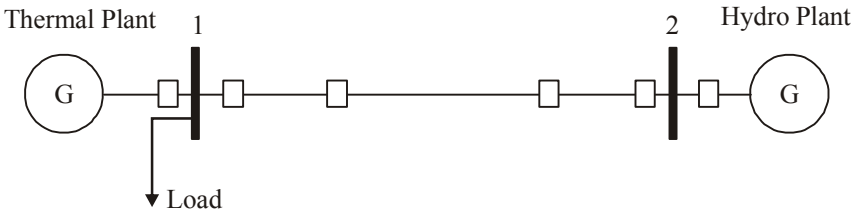
   b) Explain forward dynamic programming approach for unit commitment. Use flow chart technique to describe the procedure. (10)

4. a) Explain Short-Term Hydro-Scheduling using gradient method approach. (10)

b) A plant system having a steam plant near load center and a hydro plant at a remote location as shown in fig. The load on the system is 500MW for 16 hrs a day and 350MW for 8hrs a day. The characteristics of the units are :

$C_1 = 120 + 45P_{Gt} + 0.07P_{Gt}^2$; $w_2 = 0.6P_{Gh} + 0.00283P_{Gh}^2$ m^3/s

The loss coefficient, B22 = 0.01 MW^{-1}.



Determine the generation schedule, daily water used by the hydro plant, and daily operating cost of thermal plant, if γ_j = 85.5 Rs./m^3-hr. (10)

5. a) Explain the terms slack variables and hard limits in relation to the take-or-pay fuel contract. (10)

b) Explain the take-or-pay contract and how this improves the generation economics. (10)

6. a) Give an overview of generation control problem and explain briefly. (8)

b) Derive an expression for swing equation, and explain with the help of block diagram the relationship between electrical power and speed change. (12)

7. a) Draw neat and clean block diagram of governor, prime mover and rotating mass (generator) with speed droop feedback, and explain the various terms used. (8)

b) For a given single area with three generators connected to a common bus feeding a load. The following table contains the rating and speed droop, and initial loading of each generator. Assume D = 0; what is the new generation on unit for a 60-MW load increase? Repeat with D = 1.5 p.u.

Unit	Rating (MVA)	Speed Droop (R) p.u. on unit base	Initial Loading (MW)
1	100	0.01	80
2	500	0.015	300
3	500	0.015	400

Load base = 1000MVA. (12)

8. Write short notes on the following :

a) Lagrange's Relaxation Method,

b) Tie-line Control of two area system. (2×10)