B

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER M. TECH DEGREE EXAMINATION

Electrical Engineering

(Power Systems)

04EE6401—Optimization of Power System Operation

Time: 3 hrs Max. Marks: 60

PART A

Answer All Questions

Each question carries 3 marks

1. Explain single variable optimization technique
2. Derive the necessary conditions for solving a multivariable optimization problem with equality constraints
3. Give a note on the scenarios leading to changes in steam unit characteristics and its impacts
4. Describe Take or pay fuel supply contract. Derive the necessary conditions for optimal scheduling
5. Differentiate between long range and short range hydro scheduling schemes
6. Describe the short - term hydrothermal scheduling problem and derive the lagrange function
7. Explain the thermal input-output characteristics for typical load cycles for pumped-storage hydro plants.
8. What are the assumptions to be made while pumped storage hydro scheduling with lambda-gamma iteration?

PART B

Each question carries 6 marks

9. Minimize the function $f(x) = 2{x_1}^2 + x^2{}_2$ with starting point $\binom{1}{2}$ up to 3 iterations by Cauchy's method.

OR

10. For an unconstrained problem, a one dimensional search result in an objective function

$$F(\lambda) = \lambda^5 - 5\lambda^3 - 20\lambda + 5$$

Find the optimal value of λ using Quadratic Interpolation technique. convergence tolerance = 0.1

11. Minimize $f(x_1, x_2, x_3) = 0.5({x_1}^2 + {x_2}^2 + {x_3}^2)$ subject to $x_1 - x_2 = 0$ and $x_1 + x_2 + x_3 - 1 = 0$ by using Lagrangian method.

OR

12. Minimize the function

$$f(x) = ({x_1}^2 + 1000) + ({x_2}^2 + 1000) + ({x_3}^2 + 1000) + 20(x_1 50) + 20(x_1 + x_2 - 100)$$

Subject to the constraints $x_1 - 50 \geq 0$

$x_1 + x_2 - 100 \geq 0$

$x_1 + x_2 + x_3 - 150 \geq 0$

By Kuhn-Tucker method.

13. Discuss in detail about the different characteristics associated with steam generating units

OR

14. Determine the economic operating points for a three unit generating units using Gradient

method when delivering a total load of 800 MW by making suitable assumptions. Up to 3 iterations after the initial assumptions as P_1^0=300 MW, P_2^0=200 MW, P_3^0=300 MW.

Take $\alpha = 1$

$$H_1 = 510 + 7.2\, P_1 + 0.00142\, {P_1}^2 \ (MBtu/H)\ , \qquad 600\text{MW} \le P_1 \le 150\text{MW}$$

$$H_2 = 310 + 7.85\, \text{P2} + 0.00194\, \text{P22}\ (\text{Mbtu/H});\ 400\text{MW} \le \text{P2} \le 100\text{MW}$$

$$H_3 = 78 + 7.97\, P_3 + 0.00482\, P_3^2\ (\text{Mbtu/H}); \qquad 200\text{MW} \le P_3 \le 50\text{MW}$$

15. Explain Take-or-pay fuel supply contract. Also explain the procedure for obtaining composite generation production cost curve.

OR

16. Explain the gradient search technique for optimal scheduling in Take-or-pay fuel supply contract
17. Describe the short-Term hydrothermal scheduling problem. Explain the lamda-gamma iteration scheme for hydrothermal scheduling

OR

18. Explain the term “scheduling of Energy” and derive its necessary condition
19. Explain the Pumped storage hydro scheduling using λ-γ iteration

OR

20. Explain the short-Term hydro scheduling using gradient approach