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. Describe various aspects of statement of an optimization problem
2. Derive the necessary conditions for solving a multivariable optimization problem with equality constraints
3. Describe Take or pay fuel supply contract. Derive the necessary conditions for optimal scheduling
4. Describe the algorithm for obtaining the composite cost curve
5. Discuss about the importance and necessity of hydrothermal co-ordination
6. Describe the short - term hydrothermal scheduling problem and derive the lagrange function
7. .A hydroplant and steam plant are required to supply a constant load of 90 MW for 1 week (168 hours). The maximum limit of hydro plant generation is 10,000 MWh. Find the run time of the steam plant to be scheduled for optimum scheduling.

   The unit characteristics are

   Hydroplant: $q = 300 + 15\,P_H \;\; acre - ft/h$

   $0 \leq \; P_H \; \leq 100\; MW$

   Steam plant: $H_s = 53.25 + 11.27\,P_s \; + 0.0213\,{P_s}^2$

   $12.5 \leq \; P_s \; \leq 50\; MW$
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 $f(x) = x^5 - 5\,x^3 - 20\,x + 5$ for an interval [0,5] and 6 iterations by Golden Section method.

OR

10. 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.
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. Maximize the function $f(x_1, x_2) = (x_1^2+x_2-11)^2 + (x_1+x_2^2-7)^2$ subject to the conditions
    a. $g_1(x) = 26-(x_1-5)^2 - x_2^2 \geq 0$
    b. $g_2(x) = 20 - 4x_1 - x_2 \geq 0$
    c. $g_3(x) = x_1 \geq 0$
    d. $g_4(x) = x_2 \geq 0$

    and check whether $x_1(1,5)$, $x_2(3,2)$ are Kuhn Tucker points

13. Describe the economic dispatch problem of N thermal units committed to serve a load of P_{load}. Explain the gradient method for solution of economic dispatch.

OR

14. Explain i) Variation in steam units characteristics ii) cogeneration plants
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