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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER M.TECH DEGREE EXAMINATION

Electrical and Electronics Engineering

04EE 6401 Optimization of Power System Operations

Max. Marks: 60 Duration: 3 Hours

Part A - Answer All Questions (Each Question carry 3 Marks)

1. Define an optimization problem with suitable representations.
2. Discuss about penalty function method.
3. Discuss about the coordinate equation in optimization technique.
4. Explain the term 'pseudo price' in the case of generation with limited energy supply.
5. Explain about hydrothermal co-ordination.
6. Explain the term "*worst case prediction"* in the case of long term hydro scheduling.
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 – Answer All Questions(Each Question carry 6 Marks)

9. Explain the univariate method for engineering optimization.

or

10. Optimize $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$ from the starting point $X = \{0 \ \ 0\}^T$ using Cauchy's method up to 2 iterations.
11. 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.

Or

12. Propose a method to solve optimization problem consisting of equality constraints only. Derive its necessary and sufficiency condition.
13. Explain i) Variation in steam units characteristics ii) cogeneration plants

Or

14. Determine the economic operation points for a three unit generating units using First Order Gradient Approach when delivering a total load of 800 MW by making suitable assumptions. Up to 2 iterations after the initial assumptions.

    $H1 = 510 + 7.2\ P_1 + 0.00142\ P_1^2$ (Mbtu/H); $600MW \leq P_1 \leq 150MW$

    $H2 = 310 + 7.85\ P_2 + 0.00194\ P_2^2$ (Mbtu/H); $400MW \leq P_2 \leq 100MW$

    $H1 = 78 + 7.97\ P_3 + 0.00482\ P_3^2$ (Mbtu/H); $200MW \leq P_3 \leq 50MW$

    The fuel cost for the units are, 1.1 Rs/hr, 1 Rs/hr, 1 Rs/hr respectively for the plants.

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

or

16. What are B coefficients and their role in economic dispatch problems? Derive them.
17. Explain the term “scheduling of Energy” and derive its necessary condition. (6 marks)

Or

18. Explain in detail about hydro thermal scheduling with sufficient relations. (6 marks)
19. Explain short term hydro-thermal scheduling using gradient approach. (6 marks)

Or

20. Explain the Pumped storage hydro scheduling using λ-γ iteration. (6 marks)