**R15**

Code: 15A02606

B.Tech III Year II Semester (R15) Supplementary Examinations December/January 2018/2019
## OPTIMIZATION TECHNIQUES
(Electrical & Electronics Engineering)

Time: 3 hours                                                                                      Max. Marks: 70

### PART – A
(Compulsory Question)
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1    Answer the following: (10 X 02 = 20 Marks)
 (a) Write a short note on modern methods of optimization.
 (b) Define a usable feasible direction.
 (c) Define hyperplane.
 (d) Prove that "The intersection of any number of convex sets is also convex".
 (e) What is a one-dimensional minimization problem?
 (f) Define Fibonacci numbers.
 (g) Why is handling of equality constraints difficult in the penalty function methods?
 (h) What is the limitation of the linear extended penalty function?
 (i) What is two point cross-over?
 (j) What is hybrid intelligent controller?

### PART – B
(Answer all five units, 5 X 10 = 50 Marks)

#### UNIT – I

2    Explain the following with suitable examples:
     (i) Design vector.   (ii) Objective function.   (iii) Constraints.
**OR**
3    Solve the following problem using Kuhn-Tucker conditions:
     Maximize $f(x_1, x_2) = 2x_1 + x_2 - x_1^2$
     Subject to $2x_1 + 3x_2 \le 6$
     $\qquad 2x_1 + x_2 \le 4$
     $\qquad x_1, x_2 \ge 0$

#### UNIT – II

4    Use simplex method to solve the following LP problem:
     Minimize $Z = 5x + 6y$
     Subject to constraints $2x + 5y \ge 1500$
     $\qquad 3x + y \ge 1200$ and
     $\qquad x, y \ge 0$
**OR**
5    Find the initial BFS by north-west corner rule and least cost method for the following transportation problem. Compare the transportation cost by each of those methods.

|             | W  | X  | Y  | Z  | Availability |
|-------------|----|----|----|----|--------------|
| A           | 19 | 30 | 50 | 10 | 7            |
| B           | 70 | 30 | 40 | 60 | 9            |
| C           | 40 | 8  | 70 | 20 | 18           |
| Requirement | 5  | 8  | 7  | 14 |              |

UNIT – III

6  (a)  Min $f(X) = X_1^2 - X_1 X_2 + 3X_2^2$ use univariant method by taking starting point as (1, 2). Show calculations only for two cycles.
   (b)  State the limitations of univariant method and how do you overcome them.

**OR**

7  (a)  State the characteristics of Fibonacci method.
   (b)  Find Min $Z = X^3 - 3X - 5$. Take initial interval as [0, 1.2] and accuracy $\alpha = 10\%$. Solve it by Fibonacci method.

UNIT – IV

8  Using penalty function method, solve the following problem.
   Min $Z = (X_2 - 1)^2 + 4(X_2 - 3)^2$
   Subject to $x_1^2 + x_2^2 = 5$

**OR**

9  (a)  State the characteristics of a constrained non-linear programming problem. Classify it.
   (b)  Explain interior penalty function method for a constrained non-linear programming problem.

UNIT – V

10  What are different types of SWARM intelligence programming methods? Explain any one Swarm intelligence programming method in detail.

**OR**

11  Use genetic algorithm to solve the following NLP problem.
   Minimize $(x_1 - 1.5)^2 + (x_2 - 4)^2$
   Subject to $4.5x_1 + x_2^2 \leq 0$
   $\qquad\qquad 2x_1 - x_2 - 1 \geq 0$
   $\qquad\qquad 0 \leq x_1, x_2 \leq 4$

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