MANIPAL ACADEMY of HIGHER EDUCATION
(Deemed to be University under Section 3 of the UGC Act, 1956)

Reg. No.										

DEPARTMENT OF SCIENCES, MAHE

IV SEM M.Sc. (Applied Mathematics and Computing)

END SEMESTER EXAMINATIONS, APRIL 2018

OPTIMIZATION METHODS-II (MAT 704)

(REVISED CREDIT SYSTEM)

Time: 3 Hours Date: 19-04-2018 MAX. MARKS: 50

Note: Answer any **FIVE FULL** questions

1A. Use Fibonacci search method to locate the global minimum of f(x) = 4x sinx , $0 \le x \le \pi$, to within $\varepsilon = 0.10$.

1B. Find the maximum value of $Z = y_1^2 + y_2^2 + y_3^2$ subjected to the conditions $y_1 y_2 y_3 \le 4,\ y_i > 0,\ for\ all\ i = 1,2,3$, integers, using dynamic programming approach. **(5+5)**

2A. Find the optimal values of
$f(X) = 2x_2x_3 - 2x_1 - 4x_2 - 4x_1x_3 + 4x_3 + 2x_1x_2 + x_1^2 + x_2^2 + x_3^2.$

2B. Use dynamic programming approach to maximize Z = $5x_1 + 7x_2$, Subject to $x_1 + x_2 \le 4,\ 3x_1 + 8x_2 \le 24,\ 10x_1 + 7x_2 \le 35;\ \ x_1, x_2 \ge 0.$

(4+6)

3A. Use Newton-Raphson's method to determine the minimum value of $f(X) = 2x_1^2 + x_2^2 + x_3^2 + 6(x_1 + x_2 + x_3) + 2x_1x_2x_3$. Carryout 2 iterations. Take $X_0 = (0,0,0)^T$.

3B. A company has 6 salesmen and 3 market areas A, B, C available for sales. The following table gives the profits from each market area when the salesmen are allocated to it. Determine the number of salesmen allocated to each market area, which maximizes the total profit using dynamic programming approach.

Market Area	Salesmen						
	0	1	2	3	4	5	6
A	38	41	48	8	58	66	83
B	40	42	50	60	66	75	82
C	60	64	68	78	90	102	109

(4 + 6)

4A. Use Karush- Kuhn Tucker method to Maximize

$$Z = -6x_1 + 7x_1^2 + 5x_2^2 \quad subject\ to \quad x_1 + 2x_2 \le 10,\ x_1 - 3x_2 \le 9.$$

4B. Derive the distribution of waiting time in a Poisson queue with mean arrival rate λ and departure rate μ.

(6+ 4)

5A. Use the method of Lagrangian multipliers to maximize $Z = 9 - x_1 - 6x_2 - 4x_3 + 2x_1^2 + 2x_2^2 + x_3^2 + 2x_1x_2 + 2x_1x_3$ *subject to* $x_1 + x_2 + 2x_3 = 3.$

5B. Derive the difference-differential equation governing the queuing system M/M/1: GD/N/∞, hence derive the expression for p_n, the steady state prob. of n customers in the system , L_s and W_s.

(5 + 5)

6A. In a barber shop, there are 2 barbers available for service and 3 chairs available in the shop. The customers arrive the shop as per the Poisson distribution with the mean rate of 5 per hour and the service time for each customer is exponential with the mean of 15 minutes. Compute (i) the steady state probability of n customers in the system (ii) probability that the barbers are idle and (ii) expected number of customers in the shop.

6B. Apply Wolfe's method to solve the following quadratic programming problem.

$$Maximize\ Z = 8x_1 + 10x_2 - x_1^2 - x_2^2$$
$$Subject\ to\ 3x_1 + 2x_2 \le 6,\ x_1, x_2 \ge 0.$$

(4+ 6)

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