7. Consider the problem

Minimize $F(X_1, X_2) =$ $^2 + X_2^2$

Subject to $G_1(X_1, X_2)$: $2X_2 \leq 0$

$G_2(X_1, X_2)$ $+ 2X_2 \leq 0$

Determine whether the (int qualifications and the Kuhn Tucker cond are satisfied at the optimum point. Also state uhn Tucker condition.

8. Solve the quadratic progr g problem

Maximize $z = 2x_1 + 3x_2 - 2$

Subject to

$x_1 + 4x_2 \leq 4$

$x_1 + x_2 \leq 2$

$x_1, x_2 \geq 0$

Roll No. .....

22221

M. Tech. 1st Sem. - Mechanical Engg.

(Machine Design)

Examination – January, 2016

NUMERICAL ANALYSIS AND OPTIMIZATION

Paper : M-801-A

Time : Three Hours] *[Maximum Marks : 100*

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt any ***five*** questions. All questions carry equal marks.

1. (a) Solve the system :

$2x + 2y + z = 12$

$3x + 2y + 2z = 8$

$5x + 10y - 8z = 10$

by using Gauss elimination method

(b) Using Jacobi's Method, find the eigen value and the eigen vector of the matrix

$$A = \begin{bmatrix} 1 & \sqrt{2} & 2 \\ \sqrt{2} & 3 & \sqrt{} \\ 2 & \sqrt{2} & 5 \end{bmatrix}$$

2. (a) Fit a straight line, by the method of least squares, to the following data :

X :	1	2	3	4
Y :	14	27	40	5

(b) Given the values :

x :	300	304	3(	307
$\log_{10} x$:	2.4771	2.4829	2.	2.4871

Evaluate $\log_{10}$ 310 by using Newton's divided difference formula.

3. (a) Evaluate $\int_0^6 \frac{1}{1+x^2} dx$ using

(i) Trapezoidal rule

(ii) Simpson's rule

(b) Find $f'(10)$ from the following

x :	3	5	11	34
$f(x)$:	–13	23	899	5 35606

4. Using Runge-Kutta Method of order 4, find y for $x = 0.1, \quad 0.2, \quad 0.3$ Given that $\frac{dy}{dx} = xy + y^2, y(0) = 1$. Continue the solution at $x =$ 0.4 using Milne's Method.

5. (a) Using modified Euler's method, find y for $x = 0.1$ and 0.2 Given that $\frac{dy}{dx} = xy + y^2, y(0) = 1$.

(b) Define Optimization techniques. Write the engineering applications of optimization.

6. (a) What is the use of Lagrange' multiplier method ? What is their practical significance ?

(b) Find the minimum value of the function $f(x_1, x_2) = x_1^2 + x_2^2 - 10x_1 - 10x_2$

Subject to

$$x_1 + x_2 \leq 9$$

$$x_1 - x_2 \geq 6,$$

$$x_1, x_2 \geq 0.$$