

Q4.) Given: A optimization problem where -

4.1.

$f(Q_1, Q_2) = Q_1 + 2Q_2$  & we have to minimize it  
subject to  $g(Q_1, Q_2) \leq 0$  where  $g(x) = Q_1^2 + 4Q_2^2 - 4$

Solution: - We ~~do~~ know that we can formulate the  
above problem in the Lagrangian function  
by introducing a dual variable ( $\lambda$ ) where  
 $\lambda \geq 0$ .

Hence the Lagrangian form is -

$$L(Q_1, Q_2, \lambda) = f(Q_1, Q_2) + \lambda(g(Q_1, Q_2))$$

$$L(Q_1, Q_2, \lambda) = Q_1 + 2Q_2 + \lambda(Q_1^2 + Q_2^2 - 4) \quad \underline{\text{Ans.}}$$