4.2). Write out the KKT conditions defined Lagrangian in 4.1.

Solution:- for the general problem which needs to be optimized -

$$\min f(x)$$
$$\text{Subject to } h_i(x) \leq 0, \quad i = 1 \ldots m$$
$$l_j(x) = 0, \quad j = 1, \ldots x$$

the KKT conditions are -

a.) Stationarity : $0 \in \partial\left(f(x) + \sum_{i=1}^{m} u_i h_i(x) + \sum_{j=1}^{r} v_j l_j(x)\right)$

b.) Complementary slackness : $u_i h_i(x) = 0$ for all i.

c.) Primal feasibility : $h_i(x) \leq 0$, $l_j(x) = 0$ for all i, j.

d.) Dual feasibility : $u_i \geq 0$ for all i.

Now, we defined the Lagrangian in 4.1 as -

$$L(\theta_1, \theta_2, \lambda) = \theta_1 + 2\theta_2 + \lambda(\theta_1^2 + 4\theta_2^2 - 4)$$

∴ Applying these conditions as -