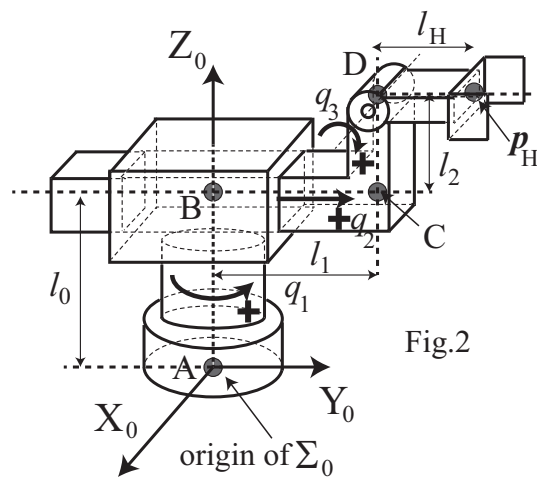Fig.1 (A)   Fig.1 (B)

(1) Original orientation of a hand is given in Fig.1 (A). After some rotations, we have an another orientation of hand shown in Fig.1 (B).
(1-1) Find the rotation matrix ^0R which represents the orientation in Fig.1 (B).
(1-2) Find Euler parameters (ϕ, θ, ψ) which rotate the hand in Fig.1 (A) to the hand in Fig.1 (B).

(2) Answer the following questions on Fig. 2.

Fig.2

(2-1) Show the relationship of the condinate frame $\Sigma_0 \sim \Sigma_3$ including the points A $\sim$ D.
(2-2) Find the Denaviet-Hartenberg parameters for the robot shown in Fig.2. Note that the origin of Σ_0 is specified, l_1 is the length of the displacement $q_2 = 0$, plus sign represents the positive direction and follow the recommendations in the textbook on some free setting of coordinate axes.
(2-3) How do you represents the vector $^0\boldsymbol{p}_H$ in Σ_0 using homogenous transfer matrix $^0T_3$. Where you do not need to show the actual elements of $^0T_3$.

(3) Sketch the C-Free region in C-Free space for the case of two-link robot arm and an obstacle of a seperate sheet.