CLASS: BTECH   SEMESTER : VI
BRANCH: ME   SESSION : SP/2023

SUBJECT: ME307 ROBOTICS ENGINEERING

TIME: 3 Hours   FULL MARKS: 50

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

		CO	BL

Q.1(a)   Referring to Fig. Q.1 (a) evaluate the transformation matrices ^A_BT and ^A_CT.   [5]   1   Evaluate
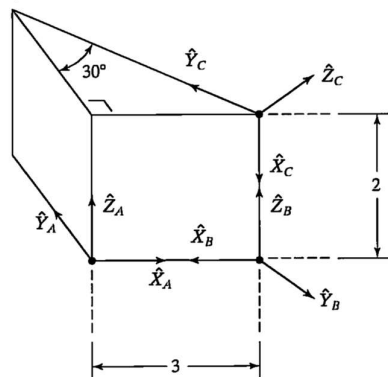

Fig. Q.1 (a)

Q.1(b)   Derive the D-H Parameter of 3R manipulator shown in Fig. Q.1 (b) and find the   [5]   1   Derive
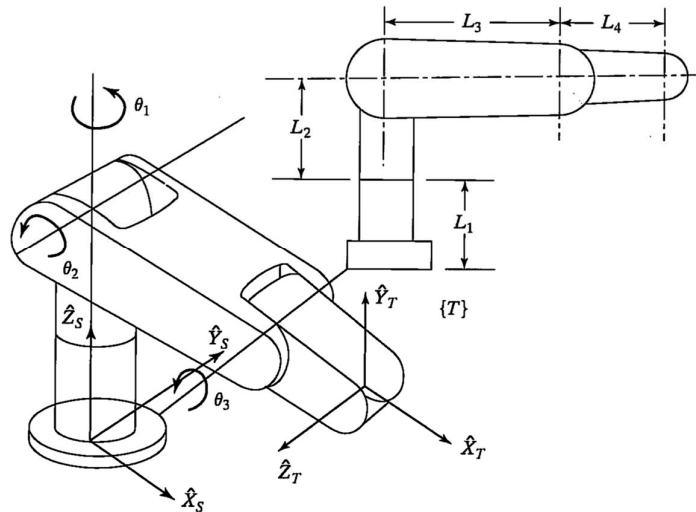homogeneous transformation matrix ^S_3T.

Fig. Q. 1 (b)

Q.2(a) Derive the inverse kinematics of 3R manipulator shown in Fig. Q.2 (a).   [5] 2 Derive
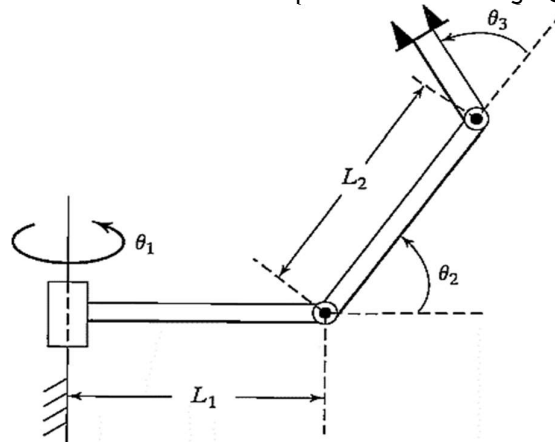

Fig. Q.2 (a)

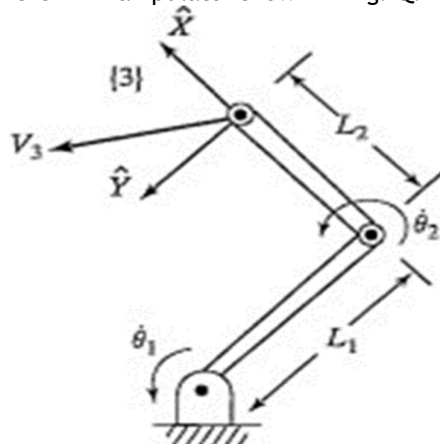Q.2(b) Find the Jacobian of the RR manipulator shown in Fig. Q.2 (b).   [5] 2 Find

Fig. Q.2 (b)

Q.3(a) Consider the case in which frame {B} is rotating relative to frame {A} with $^A\Omega_B$ [3] 3 Calculate
and {C} is rotating relative to {B} with $^B\Omega_C$. Calculate $^A\Omega_C$ and $^A\dot{\Omega}_C$.

Q.3(b) Derive equation of motion of a 2R articulated manipulator shown in Fig. Q.3 (b).   [7] 3 Derive
Assume all mass exists as a point mass at a distal end of each link.
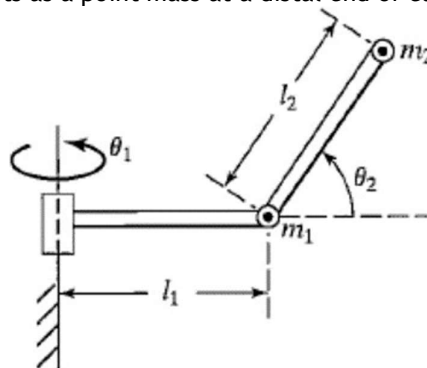

Fig. Q.3 (b)

Q.4(a) Derive the inverse kinematics of 3RPR parallel manipulator shown in Fig. Q.4 (a). [5] 4 Derive
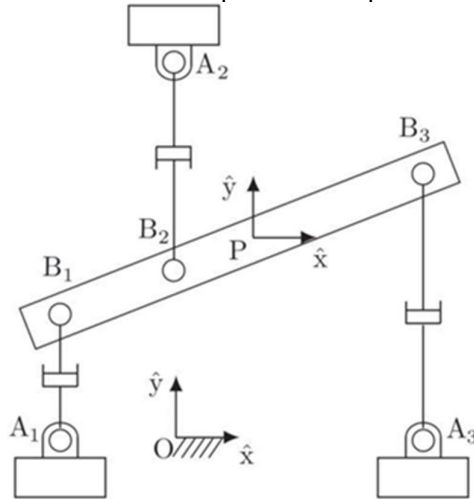

Fig. Q.4 (a)

Q.4(b) Fig. Q.4 (b) shows a planar robot with its associated dimensions and reference frame. Calculate the length of each prismatic actuator for *Px, Py, θ*. Assume suitable parameters such as side of the triangle, distance between origins of frames (1, 2, and 3), etc. [5] 4 Calculate
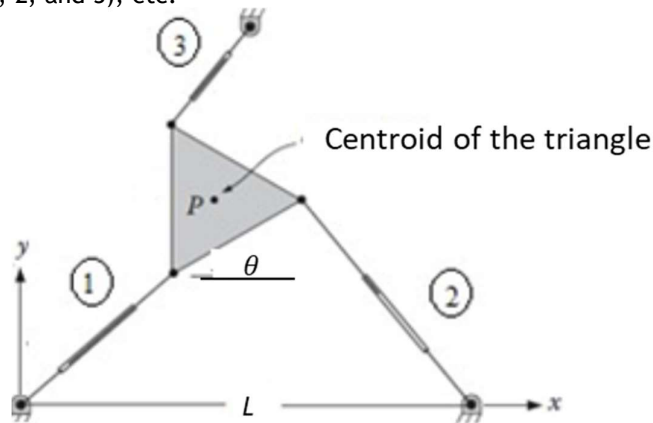

Fig. Q.4 (b)

Q.5(a) What are the different subsystems of a robotic system? Describe them briefly. [5] 5 Write
Q.5(b) (i) Write two industrial applications of Robots. [5] 5 Write,
(ii) Draw configuration of KUKA or PUMA or SCARA Robot. Draw

::::::25/04/2023::::::M