CBCS SCHEME

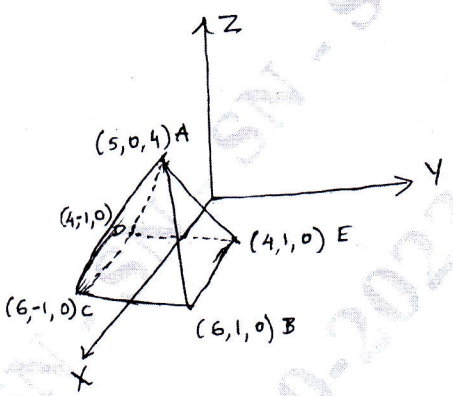
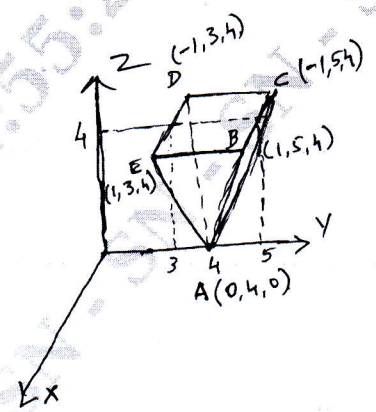
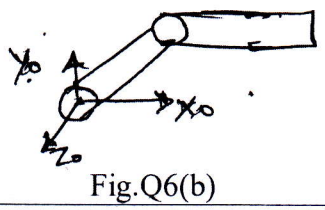
USN | | | | | | | | | | |

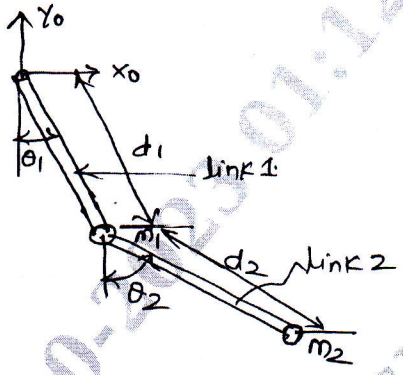
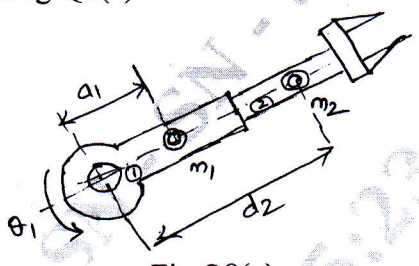
22MIA/MAR21

Second Semester M.Tech. Degree Examination, June/July 2023
Robotics for Industrial Automation

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Describe the relationship of robotics with industrial automation.	10	L1	CO1
	b.	Compare three basic types of robot drives enlisting their merits and demerits.	10	L2	CO1
		OR			
Q.2	a.	Explain the different performance parameters of robotic system.	12	L3	CO1
	b.	Sketch and explain four basic configurations of robots.	08	L3	CO1
		Module – 2			
Q.3	a.	With the help of a block diagram, explain a typical robot vision system.	10	L2	CO2
	b.	Explain the remote center of compliance as an assembly aid.	10	L3	CO2
		OR			
Q.4	a.	Discuss the fundamentals of image processing in a robot vision system.	10	L2	CO2
	b.	With a neat sketch explain the textile sensor for robotic applications.	10	L2	CO2
		Module – 3			
Q.5	a.	In Fig.Q5(a)(i), determine the proper homogenous transformation H that produces an object (Pyramid) manipulation from the initial position and orientation given by Fig.Q5(a)(ii).  Fig.Q5(a)(i)  Fig.Q5(a)(ii)	10	L3	CO3
	b.	Explain DH convention briefly.	10	L2	CO3
		OR			
Q.6	a.	Give Euler angle representation for the RPY system and derive the rotation matrix.	10	L2	CO3
	b.	A two degree of freedom robot manipulator is shown in Fig.Q6(b). Given that the length of each link is 1 unit. Establish link coordinate frame and kinematic parameters. Find 0_{A1} and 1_{A2}. Arrive at the inverse kinematic solution to this problem.  Fig.Q6(b)	10	L2	CO3

		Module – 4			
Q.7	**a.**	Obtain the L-E formation of dynamic equation for a general manipulator.	**15**	**L1**	**CO4**
	b.	Derive the expression for Joint velocities for a two link manipulator shown in Fig.Q7(b).  Fig.Q7(b)	**05**	**L3**	**CO4**
		OR			
Q.8	**a.**	Using the L-E formation determine the equation of motion for the RP manipulator shown in Fig.Q8(a).  Fig.Q8(a)	**12**	**L3**	**CO4**
	b.	Explain the following as applied to a robot arm and also discuss their importance: i) Centrifugal force ii) Coriolis component	**08**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Explain a robot program as a path in space with examples.	**10**	**L1**	**CO5**
	b.	Describe motion interpolation with an example.	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	With the help of a block diagram explain robot language structure.	**10**	**L3**	**CO5**
	b.	Give the important features of following textual robot programming languages. i) VALII ii) RAIL	**10**	**L2**	**CO5**

* * * * *