

Date: 30/12/2016.

Exam No: _____

GANPAT UNIVERSITY

M. TECH [ME-(CAD/CAM)] SEM-I CBCS REGULAR EXAMINATION NOV-DEC 2016
3ME116 ROBOTICS & ARTIFICIAL INTELLIGENCE

MAX. TIME: 3 HRS

MAX. MARKS: 60

- Instructions: (1) This Question paper has two sections. Attempt each section in separate answer book.
(2) Figures on right indicate marks.
(3) Be precise and to the point in answering the descriptive questions.

SECTION: I

Q.1 Attempt all. (10)

A Determine ZYZ Euler angles for following rotational matrix. (5)

$$R = \begin{bmatrix} -0.116 & -0.695 & -0.709 \\ 0.782 & 0.376 & -0.496 \\ 0.612 & -0.612 & 0.5 \end{bmatrix}$$

B What is similarity transformation? Explain similarity transformation with its application. (5)

OR

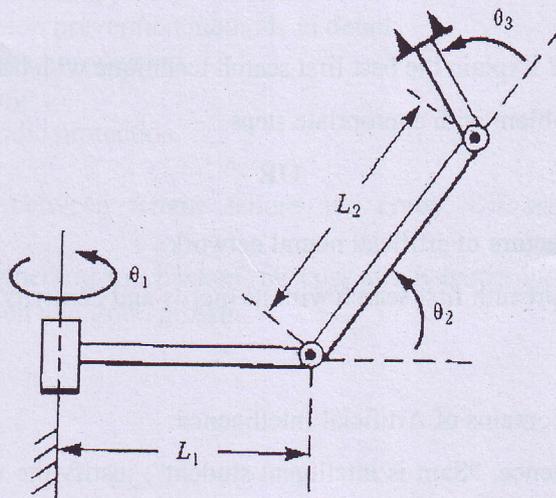
Q.1 Attempt all. (10)

A Determine XYZ fixed angles if frame has undergone following rotation: (5)

$$R = \begin{bmatrix} 0.371 & -0.339 & 0.864 \\ 0.602 & 0.797 & 0.054 \\ -0.707 & 0.5 & 0.5 \end{bmatrix}$$

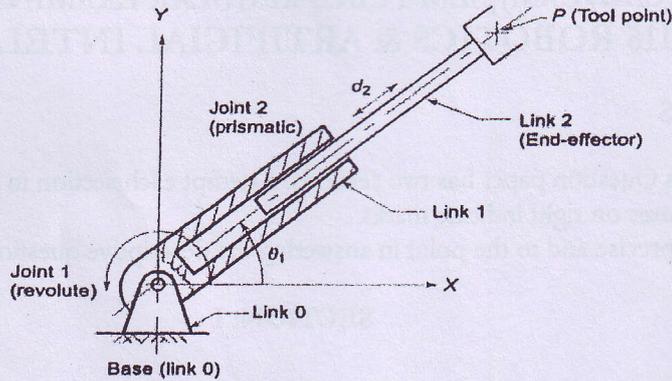
B Explain relationship between Jacobian matrix and Singularity. Also classify singularity and explain each class. (5)

Q.2 Determine forward kinematics model for following planar robotic manipulator. Do not multiply matrices. Also depict suitable home position. (10)



OR

Q.2 Determine inverse kinematic problem solution using closed form algebraic method. (10)



- Q.3 Attempt all. (10)
- A Define robots and explain different robot arm anatomy. (5)
 - B Classify end-effectors in detail and write vacuum gripper specifications. (5)

SECTION: II

- Q.4 Attempt all. (10)
- A Solve the following cryptographic problem: S E N D + M O R E = M O N E Y (5)
 - B Discuss about Water Jug Problem using state space search. (5)
- You are given two jugs, a 4-litre one and a 3-litre one. Neither have any measuring markers on it. There is a pump that can be used to fill the jugs with water. How can you get exactly 2 liters of water into 4-litre jug?

OR

- Q.4 Attempt all. (10)
- A Explain with block diagram the working of a fuzzy controller. (5)
 - B Write in brief: (1) Turing test, (2) Architecture of expert system. (5)
- Q.5 Attempt all. (10)
- A Define heuristic search? Explain the best first search technique with help of an algorithm. (5)
 - B Discuss the CHESS problem with appropriate steps. (5)

OR

- Q.5 Attempt all. (10)
- A Discuss about an architecture of artificial neural network (5)
 - B Explain in detail about breadth first search with its merits and demerits. (5)
- Q.6 Attempt all. (10)
- A Discuss about the task domains of Artificial Intelligence. (3)
 - B Define artificial intelligence. "Sam is intelligent student", justify the statement in context of intelligence. (3)
 - C Discuss with an example simple hill climbing algorithm. (4)

-----END OF PAPER-----