GANPAT UNIVERSITY
M. TECH SEM- II CAD/CAM REGULAR EXAMINATION APRIL-JUNE 2016
3ME214 ROBOTICS & INTELLIGENCE MANUFACTURING

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.

(a) For three co-ordinate frames {1},{2} and {3}, find matrix R_3^2 if given matrices are   (10)

$$R_3^1 = \begin{bmatrix} 0 & 0 & -1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix} \qquad R_2^1 = \begin{bmatrix} 1 & 0 & 0 \\ 0 & \dfrac{1}{2} & -\dfrac{\sqrt{3}}{2} \\ 0 & \dfrac{\sqrt{3}}{2} & \dfrac{1}{2} \end{bmatrix}$$

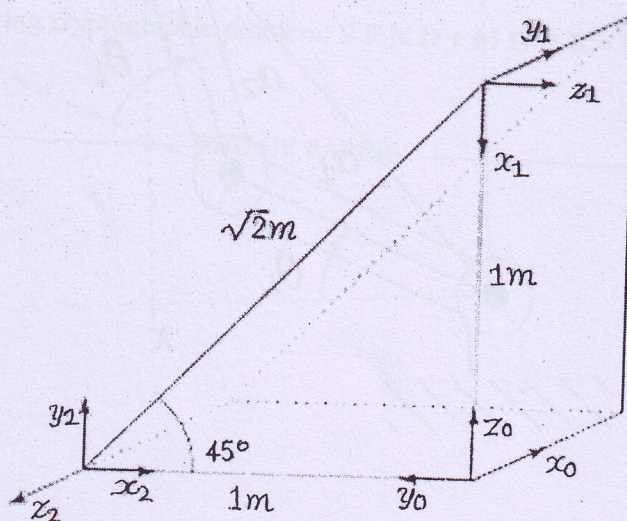(b) For following image, determine area of value content '1'.

| 0	1	1	1	0
0	1	1	1	0
0	0	1	1	0
0	0	1	0	0
0	0	0	0	0

OR

Q. 1 Attempt ALL.

(a) Write homogeneous transformation matrices H_1^0 and H_2^0 for following figure.   (10)

(b) Write a short note on perspective projection and derive expression to transform world co-ordinates into camera co-ordinates.

Q.2 Assuming suitable parameters for following robot, derive forward kinematics model using **(10)** DH conventions. Do not multiply matrices.
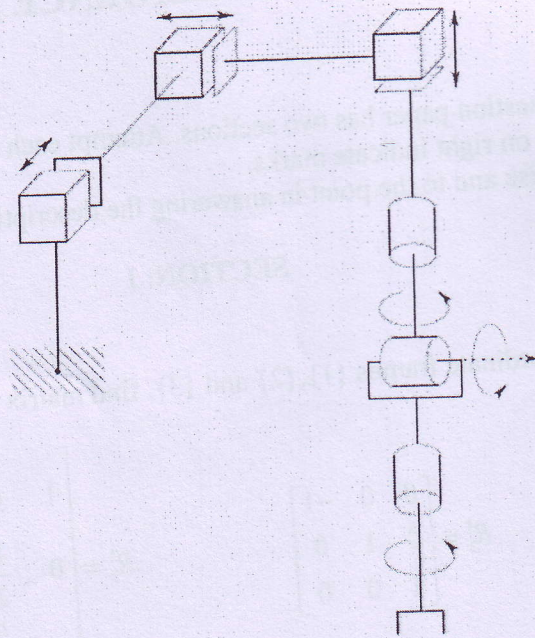
OR

Q.2 Derive forward kinematics model for following 2D planar robot. Using this forward **(10)** kinematics model, derive inverse kinematics model to determine joint angles for given pose and position of end-effector.
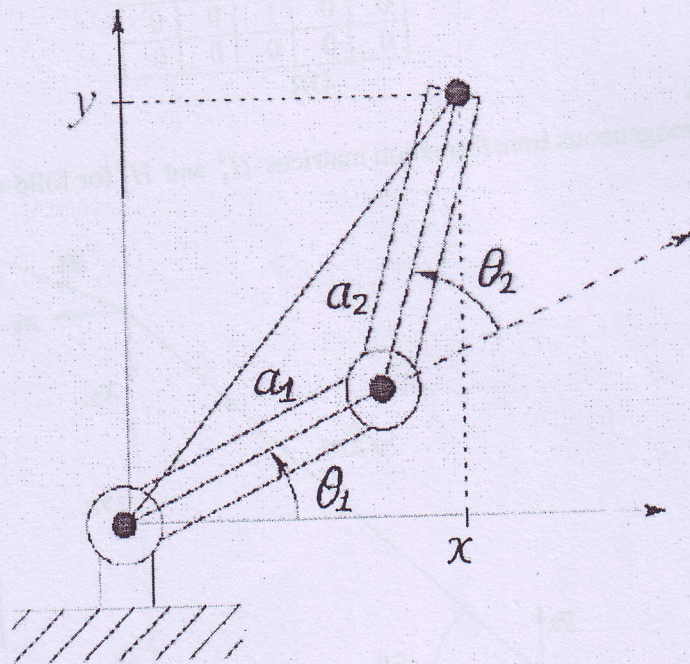
Q.3 **Attempt ALL.** **(10)**
(a) Draw a block diagram of Robotic system. Explain each block briefly.
(b) Write a short note on path planning using configuration space potential field.

Q.4 **Attempt ALL.**

   (a) Describe in detail about breadth first search with its merits and demerits. **(10)**

   (b) Brief about the simple hill climbing algorithm.

OR

Q.4 **Attempt ALL.**

   (a) Describe about task domains of Artificial Intelligence and various components of an expert system. **(10)**

   (b) Describe the chess problem in context of AI.

Q.5 **Attempt ALL.**

   (a) Define artificial intelligence. "David is intelligent student", justify the statement in context of intelligence. **(10)** **(03)**

   (b) Define: Inference engine, knowledge engineer, knowledge base **(03)**

   (c) What is an expert system? Explain under which situation experts are recommended. **(04)**

OR

Q.5 **Attempt ALL.**

   (a) Discuss about Water Jug Problem using state space search.

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 litres of water into 4-litre jug. **(10)**

   (b) Explain with block diagram the working of a fuzzy controller.

Q.6 **Attempt ALL.**

   (a) What is heuristic search? Explain with help of an algorithm the best first search technique. **(10)**

   (b) Solve the following cryptographic problem: $S E N D + M O R E = M O N E Y$

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