(Time: Three Hours) [Total Marks: 80]

Please check whether you have got the right question paper.

N.B: (1) Question No.1 is compulsory
    (2) Answer any three questions from the remaining five questions.
    (3) Assume any suitable data if necessary
    (4) Digits to the right indicate marks.

1. Write short notes on the following: 20
    (a) Differentiate Direct and Inverse kinematics
    (b) Euler angle representation
    (c)Industrial applications of Robotics
    (d) Economics of robots

2. Sketch a 3 D.O.F   Revolute configuration (RRR) Robotic manipulator and
    Formulate direct kinematics model. Assume necessary
    Parameters. 20

3. a) Describe the types of end effectors used in manipulator. 10
   b)  Describe the power transmission systems used in robotics. 10

4. a) Explain Position, velocity and acceleration sensors used in robotics. 10
   b) Explain basic control system concepts and models used in robotics. 10

5. a)Explain the trajectory with a trapezoidal velocity profile. 10

   b) Explain the following algorithms of Image processing 10

       i) Segmentation.
       ii) Edge detection

6. Write short notes on the following: 20

    a)   Task Planning
    b)   Image acquisition and digitization.
    c)   Robot Languages
    d)   Means - Ends analysis in  AI

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