

Total No. of Questions : 10]

SEAT No. :

P3678

[4959]-1045

[Total No. of Pages : 2

B.E.(Mechanical)

ROBOTICS

(2012 Course) (Elective-III)(Semester-II) (End Sem)(402049B)

Time : 2½Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Figures to the right indicate full marks.*
- 2) *Draw neat figures wherever necessary.*
- 3) *Use of Scientific calculators is allowed.*

Q1) a) Define a robot with neat sketch. Explain anatomy of robot. **[4]**

b) A camera locates an object by **[6]**

$$\text{camera } T \text{ Object} = \begin{bmatrix} 0 & -1 & 0 & 50 \\ 1 & 0 & 0 & -85 \\ 0 & 0 & 1 & 25 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

The camera is then translated by 20 units along Z axis of the object, and then rotated about its own X axis by -90° . Determine the new relation between camera and the object.

OR

Q2) a) Explain the construction and working of Brushless DC Motor with neat sketch. State its advantages and disadvantages. **[4]**

b) Explain in detail degree of freedom of parallel mechanism with suitable example. **[6]**

Q3) a) Explain the design considerations of gripper selection? **[4]**

b) Explain in details the singularity analysis in serial and parallel manipulators. **[6]**

OR

Q4) a) Classify the sensors and discuss the factors to be considered for its selection. **[4]**

b) Explain in detail the concept of Velocity Propagation **[6]**

P.T.O.

- Q5)** a) What are the different tools used in simulation of robotics? [6]
b) Explain in details, Euler-Lagrange formulation for dynamics. [10]

OR

- Q6)** a) What is RIDIM? What are the features of RIDIM? [6]
b) Write notes on [10]
i) Recursive Forward Dynamics Algorithm
ii) Recursive Inverse Dynamics Algorithm

- Q7)** a) Explain in detail the Turning Method of PID control. [10]
b) First joint of 3R robot is to be rotate from 20° to 65° in 5 seconds. Determine the linear trajectory and its rotation after 3 seconds. [6]

OR

- Q8)** a) Explain in detail Trajectory planning of robot with its terminology. [6]
b) Discuss potential field method.
The second joint of a SCARA manipulator is required to move from $\theta_2=30^\circ$ to 150° in 5 seconds. Find the cubic polynomial to generate the smooth trajectory for the point. What is the maximum velocity and acceleration for this trajectory? [10]

- Q9)** a) Explain in details the image processing techniques and image segmentation. [12]
b) Discuss in details, problem solving through forward and backward search in artificial intelligence. [6]

OR

- Q10)** a) Write short notes on following(any two) [8]
i) Linear Kalman filter
ii) Sampling and quantization
iii) Image acquisition and masking.
b) Explain in details the need and applications of artificial intelligence. [10]

