Total No. of Questions : 10]

SEAT No. :

P3678

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[4959]-1045
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]**

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

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) Explian 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 form 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 θ_2=30° 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 artifical 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]**