

C

Reg. No. :

--	--	--	--	--	--	--	--	--	--

**Question Paper Code: 99402**

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2022

Elective

Electronics and Communication Engineering

19UEC902- PRINCIPLES OF ROBOTICS

(Regulation 2019)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. If a robot has 3 legs, then the number of possible events is CO1-U  
(a) 24                      (b) 720                      (c) 120                      (d) 240
2. The unit of linear acceleration is CO2- U  
(a) kg-m                      (b) m/s                      (c) m/s<sup>2</sup>d                      (d) rad/s<sup>2</sup>
3. The inertia matrix of a rigid body or a link CO3- U  
(a) is always positive definite  
(b) is always symmetric  
(c) is an orthogonal matrix  
(d) represents the mass distribution in 3D space
4. Gross motion planning problem is known as? CO4- U  
(a) Fine motion planning problem.                      (b) Free space motion planning problem.  
(c) Compliant motion planning problem                      (d) none of the above.
5. What is necessary for a lot of sensible mobile robotics function? CO5- U  
(a) Map discovery                      (b) Geometric Maps                      (c) Perceptual maps                      (d) Sensorial maps

PART – B (5 x 3= 15 Marks)

6. What is meant by robot anatomy? CO1 U
7. What is meant by unit Quaternion CO2 U
8. Define Linear velocity. CO5 U

9. Define path. CO3 U
10. Mention the need of continuous Trajectory Recording CO3 U

PART – C (5 x 16= 80 Marks)

11. (a) Explain the different types of robots with neat diagrams CO1-U (16)  
Or  
(b) Discuss about micro machines in robotics CO1-U (16)
12. (a) Derive the Denavit- Hartenberg representation of forward kinematic equations of robots CO2- App (16)  
Or  
(b) Derive the direct kinematics equation of SCARA robot using D H transformation matrix. CO2- App (16)
13. (a) Express the jacobian matrix for motion of end-effector generated by a rotary joint and prismatic joint. CO1-U (16)  
Or  
(b) Explain the following: CO1-U (16)  
(i) Wrist and arm singularity  
(ii) Linear and Angular velocities
14. (a) Implement interpolation function with the help of p-Degree polynomial and discuss its uses. CO3- Ana (16)  
Or  
(b) Express the time history of position velocity and acceleration for blended trajectory for point-to-point motion with via points. CO3- Ana (16)
15. (a) Discuss in detail Methods of Robot programming with suitable example. CO1-U (16)  
Or  
(b) Explain in detail Robot program as a path in space with suitable example CO1-U (16)