Sample Questions

Information Technology

Subject Name: Robotics **Semester: VIll**

Multiple Choice Questions

	Choose the correct option for following questions. All the Questions carry equal marks
1.	Bounded deviation algorithm gives:
Option A:	Optimal path
Option B:	Obstacle free path
Option C:	Shortest path
Option D:	Longest path
2.	In Jacobians matrix of any dimension rows and columns equal to
Option A:	The number of rows equals the number of degrees of freedom and the number of columns is equal to the number of joints of the manipulator
Option B:	The number of rows equals the number of joints of the manipulator equals and the number of columns is equal to the number of degrees of freedom
Option C:	The number of rows equals the number of forces acting on manipulator and the number of columns is equal to the number of degrees of freedom
Option D:	The number of rows equals the number of joints of the manipulator and the number of columns is equal to Torques
3.	In robot, two vectors x and y in Rn are said to be orthogonal to each other
Option A:	If their Dot product is one
Option B:	If their cross product is zero
Option C:	If their Dot product is zero
Option D:	If their cross product is one
4.	In robotics, Inverse kinematics is used for
Option A:	Finding orientation of tool with respective base
Option B:	Mapping from the tool configuration space R6 back to joint space Rn
Option C:	Finding tool configuration space Rn
Option D:	Mapping from joint space Rn to the tool configuration space R6
5.	Humanoid robot can have:
Option A:	Facial expressions
Option B:	Human features
Option C:	Expressions with features
Option D:	Exactly similar to human
6.	The number of movable joints in the base, arm and end effector determines:
Option A:	Flexibility
Option B:	Payload
Option C:	Operational limit
Option D:	Degrees of freedom

7.	What is meant by forward dynamics?
Option A:	Calculation of torques equation
Option B:	Calculation of motion equation if joint torques or end-effector forces are given
Option C:	Calculation of motion equation
Option D:	Calculation of joint torques or end-effector forces if motion variables are given
8.	Industrial robot is generally designed to carry out which coordinate system:
Option A:	Polar
Option B:	Cartesian
Option C:	Cylindrical
Option D:	Spherical
9.	1) head toward goal 2) follow obstacles until you can head toward the goal again 3) continue These are the steps of _____ algorithm
Option A:	BUG '0'
Option B:	BUG 1
Option C:	BUG 2
Option D:	Tangent BUG
10.	Inverse dynamics is used when
Option A:	Calculation of motion equation is required
Option B:	Calculation of torques equation is required
Option C:	motion variables are given to calculate joint torques or end-effector forces
Option D:	Calculation of motion equation if joint torques or end-effector forces are given
11.	_____is a union of curves such that for all start and goal points in Qfree that can be connected by a path.
Option A:	Voronoi cell
Option B:	Roadmap
Option C:	Gradient Descent
Option D:	Voronoi diagram
12.	In which of the following continuous path system is used:
Option A:	Pick and place
Option B:	Loading and unloading
Option C:	Welding
Option D:	Spray painting
13.	This method involves modeling the robot as a particle moving under the influence of a potential field that is determined by the set of obstacles and the target destination.
Option A:	visibility graph

Option B:	Roadmap
Option C:	potential field
Option D:	Cell Decomposition
14.	Visibility graph is a graph of intervisible locations, typically for a set of points and obstacles in the :
Option A:	3D plane
Option B:	2D plane
Option C:	Euclidean plane
Option D:	Surface plane
15.	Which of the following term is used to for defining compressed gases to drive the robot
Option A:	Electric
Option B:	Piezoelectric
Option C:	Hydraulic
Option D:	Pneumatic
16.	Spherical wrist has two joint which are:
Option A:	Coincident
Option B:	Non coincident
Option C:	Similar
Option D:	Dissimilar
17.	Coverage of robot means that determining a path that passes over all points in :
Option A:	2D space
Option B:	3D space
Option C:	Free space
Option D:	Work space
18.	The motion between the two points is known at all times and controllable is called
Option A:	Cartesian space description
Option B:	Joint-space description
Option C:	Degrees of freedom
Option D:	Path
19.	SLAM stands for
Option A:	Simultaneous Localization and Mapping
Option B:	Standard Localization and Mapping
Option C:	Simultaneous Localization and Maps
Option D:	Standard Localization and Maps
20.	In HCTM scaling factor is used as:

Option A:	0
Option B:	1
Option C:	Less than 1
Option D:	Greater than 1

Descriptive Questions

10 marks each
A point P in space is defined as Bp = (5, 3, 4)T relative to frame B which is attached to the origin of the reference frame A and is parallel to it. Apply the following transformations to frame B and find Ap. 1. Rotation of 90 degree about x-axis; then 2. Translate 3 units about y-axis, 6 units about z-axis, and 5 units about x-axis; then 3. Rotate 90 degrees about the z-axis.
Explain the different Template Matching techniques.
Discuss classification of robots based on the geometry of the work envelope.
Explain the bounded deviation algorithm for achieving straight line motion in the tool configuration space with a neat diagram.
Explain DK analysis of a 5 axis Rhino XR-3 robot.
Explain Bug 2 algorithm in detail.
Derive the force-acceleration relationship for the one-degree of freedom system.
Explain the direct kinematic solution of the 3-axis Robot.
Why IK never gives unique solution? Explain TCV.

5 marks each
Frame {2} is rotated with respect to frame {1} about x -axis by an angle of 60 degree . The position of the origin frame {2} as seen from frame {1} is1D2 = [7.0 5.0 7.0]T. Obtain the transformation matrix 1T2, which describes frame {2} relative to frame {1} if 2P= [2.0 4.0 6.0]T.
Explain Object tracking using Discrete Wavelet Transform.
Describe Trapezoidal Decomposition with an example.
Explain IK analysis of a 2-axis robot.
Explain with neat diagram Task Planner System in detail.
Explain DK analysis of a 5 axis Rhino XR-3 robot.
It is desired to have the first joint of a six-axis robot go from an initial angle of 30degree to a final angle of 75degree in 5 seconds. Using a third-order polynomial,calculate the joint angle at 1, 2 3, and 4 seconds.

Describe Denavit -Hartenberg (DH)Algorithm.
Explain Linear Interpolation with parabolic blends and state its advantages.