

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous) Dundigal, Hyderabad - 500 043

AERONAUTICAL ENGINEERING

DEFINITIONS AND TERMINOLOGY QUESTION BANK

Course Name	:	INTRODUCTION TO ROBOTICS		
Course Code	:	AME553		
Program	:	B.Tech		
Semester	•••	VI		
Branch	:	Aeronautical Engineering		
Section	:	A & B		
Academic Year	:	2019 - 2020		
Course Faculty	:	Mr. A Anudeep Kumar, Assistant Professor		

COURSE OBJECTIVES:

The	course should enable the students to:					
Ι	Develop the knowledge in various robot structures and their workspace.					
II	Develop the skills in performing kinematics analysis of robot systems.					
III	Provide the knowledge of the dynamics associated with the operation of robotic systems.					
IV	Provide the knowledge and analysis skills associated with trajectory planning.					
V	Understand material handling and robot applications in industries.					
τοι	COURSE OUTCOMES:					

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CO 1	Understand characteristic features of robots and usage of different grippers for industrial applications.
CO 2	Understand direct and inverse kinematics of robot structure.
CO 3	Illustrate Differential Kinematics of planar and spherical manipulators.
CO 4	Understand classification of robot actuators and trajectory planning.
CO 5	Remember material handling and applications in manufacturing.

DEFINITIONS AND TERMINOLOGY QUESTION BANK

S.No	QUESTION	ANSWER	Blooms Level	СО	CLO	CLO Code
		UNIT-I				
1	Define	Automation is the technology by	Understand	CO 1	CLO 1	AME553.01
	Automation.	which a process or procedure is				
		accomplished without human				
		assistance.				
2	Define Fixed	Fixed automation is a system in	Remember	CO 1	CLO 2	AME553.02
	Automation.	which the sequence of				
		processing (or assembly)				

S.No	QUESTION	ANSWER	Blooms Level	СО	CLO	CLO Code
		operations is fixed by the				
		equipment configuration. Each				
		of the operations in the sequence				
		is usually simple, involving				
		perhaps a plain linear or				
		rotational motion or an				
		uncomplicated combination of				
		the two.				
3	Explain	In programmable automation the	Remember	CO 1	CLO 2	AME553.02
	Programmable	production equipment is				
	Automation.	designed with the capability to				
		change the sequence of				
		operations to accommodate				
	1	different product configuration.				
		The operation sequence is				
		controlled by a program, which				
		that they can be read and				
		interpreted by				
		the system				
4	Define Flexible	Elexible automation is an	Remember	CO 1	CLO 1	AME553.01
	Automation.	extension of programmable	remember	001		71012353.01
		automation. A flexible				
		automated system is capable of				
		producing a variety of parts (or				
		products) with virtually no time	and the second second			
		lost for changeovers from one				
		part style to the next. There is no				
		lost production time while				
		reprogramming the system and	Contraction of the second			
		altering the physical setup				
	200 C	(tooting, fixtures, machine				
~		settings).	D 1	00.1	CT O 1	
2	Define the term	A programmable	Remember	COT	CLO 4	AME553.04
	KODOL.	designed to move material				2
	1	parts or spacialized devices				
		through variable programmed			A	
	0	motions for the performance of				
		a variety of tasks "			100	
6	Define	An Articulated robot can be	Remember	CO 1	CLO 4	AME553.04
	Articulated	defined as a robot with rotary		2.3		
	Robot.	joint and these robots can range		~		
		from simple two-jointed		2.1		
		structures to systems with 10 or				
		more interacting joints.	1			
7	Define	Anthropomorphism is a	Remember	CO 1	CLO 1	AME553.01
	Anthropomorphis	phenomenon that describes the				
	m.	human tendency to see human-				
0	XX71	like shapes in the environment.		00.1		A) (5552-01
8	What is	Humanoid robot is a robot with	Remember	COT	CLO I	AME553.01
	Humanold robot?	its body snape built to resemble				
		mey be for functional purposes				
		such as interacting with human				
		tools and environments for				
		experimental purposes such as				
		the study of bipedal locomotion				
		or for other purposes.				

S.No	QUESTION	ANSWER	Blooms Level	СО	CLO	CLO Code
9	What is PTP	Point-to-point (PTP) control	Remember	CO 1	CLO 3	AME553.03
	control robot.	robot: is capable of moving				
		from one point to another point.				
		The locations are recorded in the				
		control memory.				
10	Define CP	Continuous-path (CP) control	Remember	CO 1	CLO 3	AME553.03
	control Robot.	robot: with CP control, the robot				
		can stop at any specified point				
		along the controlled path.				
11	Define controlled	Controlled-path robot: the	Remember	CO 1	CLO 3	AME553.03
	path robot.	control equipment can generate				
		paths of different geometry such				
		as straight lines, circles, and				
		interpolated curves with a high			4	
		degree of accuracy.				
12	Describe	Controller is much like the	Remember	CO 1	CLO 3	AME553.03
	controller.	human brain which coordinates				
		the muscles and all other parts				
		of the body. It keeps track of				
		time, the position of the joints,				
		and the movements of the				
		manipulator. It does this as per				
		programme and with a list of				
		instructions. The instructions are				
		stored in the memory unit of				
		controller.				
13	What is a	The manipulator in the present	Understand	CO 1	CLO 3	AME553.03
	manipulator?	case is the entire mechanism of				
	1	the robot that provides				
		movement of any degree of	Contraction of the second			
		freedom. Therefore it consists of				
		base, arm and gripper.				
14	Define Gripper.	The gripper is similar to the	Remember	CO 1	CLO 4	AME553.04
	11	human hand. Just as the hand	-			
	0	grasps the tool to perform the			- C	
		work, the gripper secures the				e
		robot's work piece while the				
		operation is being performed.			· · · ·	
		The shape of the gripper is				
		determined by the task it has to			- C	
		perform.				
15	Define end	In the robotic world it is	Remember	CO 1	CLO 4	AME553.04
	effector.	generally understood that the	1.0	1		
		end of the wrist is the end of the				
		robot. The end effector is the				
		correct name for the attachment				
		that can be mounted to a bolting				
		plate fitted to the wrist				
		UNIT-II				
1	What is notation	Dotation matrix describes d	Domomter	<u>CO 2</u>	CLOS	AME552.05
1	what is rotation	mutual orientation between the	Kennennber	02	CLU 5	AME333.03
	matrix :	inutual orientation between two				
		coordinate frames; its column				
		of the area of the restated for				
		of the axes of the rotated frame				
		with respect to the original				
		trame. It represents the				
		coordinate transformation				
		between the coordinates of a			1	

S.No	QUESTION	ANSWER	Blooms Level	СО	CLO	CLO Code
		point expressed in two different				
		frames (with common origin).				
2	Define	Kinematics pertains to the	Remember	CO 2	CLO 6	AME553.06
	kinematics of	motion of bodies in a robotic				
	robotics	mechanism				
		without regard to the				
		forces/torques that cause the				
		motion. Since robotic				
		mechanisms are by their very				
		essence designed for motion,				
3	Define	Most generally, the workspace	Understand	CO 2	CLO 7	AME553.07
	workspace or	of a robotic manipulator is the				
	work envelope.	total				
	1	volume swept out by the end-				
		effector as the manipulator				
		executes all possible motions.				
		The workspace is determined by				
		the geometry of the manipulator				
4	Describe forward	The forward kinematics of	Understand	CO 2	CLO 8	AME553.08
	kinematics.	manipulator is to find the				'
		position and orientation of the				
		end-effector relative to the base				
		given the positions of all of the				
		joints and the values of all of the				
		geometric link parameters.				
5	Describe inverse	The inverse kinematics	Understand	CO 2	CLO 8	AME553.08
	kinematics.	manipulator is to find the values				
		of the joint positions given the				
		position and orientation of the				
		end- effector relative to the base	Contraction of the second			
		and the values of all of the				
		geometric link parameters.				
6	Define DH	The DH parameters were first	Remember	CO 2	CLO 5	AME553.05
	notation or	appeared in 1955 to represent a	-			
	Parameters.	directed line which is nothing			- C	
		but the axis of a lower pair joint.				e
7	What is world	World coordinate system is a	Remember	CO 2	CLO 6	AME553.06
	coordinate	coordinate system whose origin			· · · ·	
	system?	is specified by a user. This				
		system enables multiple robots			- C	
	· · · · · ·	to use a common coordinate			1. C	
		system for position				
	101	designation. By setting the	1.0	1		
		origin of the facilities to that of	1.1.1			
		the world coordinate system,	1.1			
		you can set positions of different				
		robots on the same coordinate				
		system.				
8	What is joint	Joint coordinate system Joint	Remember	CO 2	CLO 7	AME553.07
	coordinate	coordinates specify the location				
	system?	of each axis in encoder counts.				
		When the axes move, the optical				
		encoders generate a series of				
		alternating high and low				
		electrical				
		signals. The number of signals is				
		proportional to the amount of				
		axis motion; the controller				
		counts the signals and				
		determines how				

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		far an axis has moved.				
9	What is DC servo	The motor which is used as a	Remember	CO 2	CLO 8	AME553.08
	motor ?	DC servo motor generally have				
		a separate DC source in the field				
		of winding & armature winding.				
		The control can be archived				
		either by controlling the				
10	XX71	armature current or field current	D	<u> </u>		ANTE552.05
10	what is stepper	A stepper motor is just another	Remember	02	CLO 5	AME553.05
	motor ?	a digital DC motor Stopper or				
		a digital DC motor. Stepper of				
		select				
11	What is position	A position sensor is any device.	Domomhor	CON	CLOG	AME552.06
11	sensor?	that permits position	Kemeniber	CO 2	CLO 0	AME333.00
	sensor :	measurement. It can either be an		\sim		
		absolute position sensor or a				
		relative one position sensors can				
		be linear, angular, or multi-axis.				
12	What is	A potentiometric sensor is a	Remember	CO 2	CLO 7	AME553.07
	potentiometric	type of chemical sensor that				
	sensor?	may be used to determine the				
		analytical concentration of some				
		components of the analyze gas		_		
		or solution. These sensors				
		measure the electrical potential		_		
		of an electrode when no voltage		_		
13	Explain resolver?	A resolver is a type of rotary	Remember	CO 2	CLO 8	AME553.08
10	Explain resolver.	electrical transformer used for	itemenioer	002	CLO U	11111111111111111
		measuring degrees of rotation.				
14	Explain encoder?	An encoder is a device, circuit,	Remember	CO 2	CLO 5	AME553.05
		transducer, software program,				C
		algorithm or person that			100	
		converts information from one		_	· · · ·	2.
		format or code to another, for	and the second second			
		speed or compression			-	
15	What is velocity	A velocity or speed sensor	Remember	CO 2	CLOG	AME553.06
15	sensor?	measures consecutive position	Remember	002	CLO 0	71012555.00
	Sensorr	measurements at known			· · · · ·	
		intervals and computes the time		9.7		
		rate of change in the position		× .		
		values.				
1	What is	Differential Kinematics is the	Understand	CO 3	CLO 09	AME553.09
	differential	relations between motion				
	kinematics?	(velocity) in joint space and				
		motion (linear/angular velocity)				
		in task space		ac -		
2	What is Jacobian	Each column of the Jacobian	Remember	CO 3	CLO 10	AME553.10
	matrix?	matrix defines the effect of the i-				
		un joint on the end-effector				
		terms. The first term considers				
		the effect of on the linear				
		velocity v. while the second one				
		on the rotational velocity				

S.No	QUESTION	ANSWER	Blooms Level	СО	CLO	CLO Code
3	What is robot	robot's dynamics provide a	Remember	CO 3	CLO 11	AME553.11
	dynamics?	description of why things move				
		when forces are generated in				
		and applied on the system				
4	Define principle	Principle of Virtual Work A	Remember	CO 3	CLO 12	AME553.12
	of virtual work?	fundamental principle in				
		mechanics is the principle of				
		virtual work which describes the				
		fact that configuration				
		forces which do not perform				
		work in the direction of the				
		virtual displacements				
5	State Lagrangian	In the lagrangian formulation.	Remember	CO 3	CLO 09	AME553.09
_	formulation?	the system's dynamic behavior				
		is described in terms of work				
		and energy using generalized				
		coordinates. This approach is				
		the extension of the indirect				
		method. Therefore, all the				
		workless forces and constraint				
		forces are automatically				
6	Stata Nowton	The Newton Euler formulation	Understand	CO 3	$CI \cap 10$	AME552 10
0	State Newton-	is derived by the direct	Understand	05		AME555.10
	formulation?	interpretation of Newton's				
	ionnununon.	Second Law of Motion, which				
		describes dynamic systems in				
		terms of force and momentum.				
		The equations incorporate all the				
		forces and moments acting on				
		the individual robot links,				
		including the coupling forces				
7	What is	The connectivity of a robot	Pomomhor	CO 3	CLO 11	AME552 11
/	kinematic Tree?	mechanism can be described	Kemember	05	CLUII	AME555.11
	Killematic Tree:	using a graph in which the nodes	and the second			
		represent the bodies and the arcs			-	
		represent the joints. If this graph				
		does not contain any cycles,			100	
		implying that it is a topological			h	
		tree, then the robot mechanism			(Car)	
	10	is called a kinematic tree.		1		
8	Explain	If the connectivity graph does	Understand	CO 3	CLO 12	AME553.12
	kinematic loop?	contain cycles, then the robot	1.1			
		mechanism contains kinematic				
		loop system The three				
		dynamics algorithms described				
		above do not work on closed-				
		loop systems, although they can				
		be used as components in a				
		closed-loop dynamics algorithm.				
		In general, closed-loop systems				
		have more complicated				
		dynamics than kinematic trees,				
		and they require more				
		algorithms to calculate their				
		dynamics.				

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
9	What is RNEA?	Recursive Newton-Euler	Remember	CO 3	CLO 09	AME553.09
		algorithm (RNEA). This				
		algorithm solves the inverse				
		dynamics problem, and has a				
		computational complexity of				
1.0		O(n).		~~ ~	GT 0 10	
10	What is ABA?	The articulated-body algorithm	Remember	CO 3	CLO 10	AME553.10
		(ABA): This algorithm solves				
		and has a computational				
		complexity of $O(n)$.				
11	What is CRBA?	Composite-rigid-body algorithm	Remember	CO 3	CLO 11	AME553.11
		(CRBA): This algorithm	_	-		
		calculates the joint-space inertia				
		matrix, H, and has a computational complexity of	P	\sim	A	
		$O(n^2)$				
12	Explain	A different approach is to	Remember	CO 3	CLO 12	AME553.12
	workspace	transform the dynamics and				
	control?	control problem into the task				
		space, so that the control law				
		effector position and				
		orientation. We refer to this				
		approach as workspace				
		control.				
13	Differentiate	A robot is said to have a fixed	Remember	CO 3	CLO 09	AME553.09
	fixed & floating	base if it is rigidly attached to a				
	robotics?	robot arm is a good example of				
	loodies.	a fixed-base robot. If no part of				
		the robot mechanism is fixed,			0	-
		then it is said to have a floating	·	_		
14	Define Motion	For given N path points, find an	Remember	CO 3	CLO 09	AME553.09
•••	through a	interpolating function through		000	020 07	
	sequence of	these points N - 1 order			~	
	points.	polynomial			-	
15	Define path.	locus of points in joint space	Remember	CO 3	CLO 10	AME553.10
		(operational space) which the			h	
		execution of the assigned		85		
		motion.		1.		
		UNII-IV				
1	What is	Trajectory planning is moving	Remember	CO 4	CLO 13	AME553.13
	trajectory	from point A to point B while				
	planning?	avoiding collisions over time.				
		discrete and continuous				
		methods. Trajectory planning is				
		a major area in robotics as it				
		gives way to autonomous				
		vehicles. Trajectory planning is				
		sometimes referred to as motion				
		plaining and erroneously as path planning.				

2 What are geometric constraints are the geometric constraints are the servessed solely in terms of the robot joint age(s, avoidance of self-collision and of collision with obtacles, etc. These constraints can thus be fully taken into account in the path planning step. Remember CO 4 CLO 15 AME553.14 3 What is role of optimization comes into play into trajectory that allow achieving the task while satisfying the constraints. It is then interesting to select the path or trajectory that allow achieving the task while satisfying the constraints. It is then interesting to select the path or trajectory that allow achieving the task while satisfying the constraints. It is then interesting to select the path or trajectory planetation is in common usage in robotics to provide smooth, continuous pate in planetation from one set of a plan in agles. Remember CO 4 CLO 16 AME553.16 5 What is the role of optimization common usage in robotics are given objective is to moving between two distinct Cartesian poses for which the inverse pose soulton has yielded two distinct sets of a plan in agles. Remember CO 4 CLO 13 AME553.13 6 What is the role of obstacle avoidance. The obstacle avoidance is to collisions with the obstacle's detected by the sensors during motion execution disting the control for or set or collisions with the obstacle's detected by the sensors during motion execution in the sample the obstacle avoidance is to collisions with the obstacle's commanded to travel from one point in collision with the obstacle's commanded to travel from one point in collision with the obstacle's commanded to travel of poin indowing motion execution is a simplest type	S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
What are geometric constraints? constraints that can be expressed services and solution constraints? constrai	2		Geometric constraints are the	Remember	CO 4	CLO 14	AME553.14
geometric constraints? solely in terms of the robot joint agles, these include bounds on the joint angles, avoidance of self-collision and of collision with obstacles, etc. These constraints can thus be fully taken into account in the path Remember CO 4 CLO 15 AME553.15 3 What is role of optimization Optimization comes into play when there are more than one path or trajectory that allow achieving the task while adjreen objective. Remember CO 4 CLO 16 AME553.16 4 What is Joint Joint-space trajectory generation is recommon better. Remember CO 4 CLO 16 AME553.16 5 What is ther avoidance ? A complementary way to address the motion problem is objective is to more a vehicle to provide studence. The objective is to more a vehicle avoidance? Remember CO 4 CLO 13 AME553.13 6 What is her advantage of reactive obstacle avoidance? The advantage of reactive objective is to more a vehicle to rompute motion by introducing the control loop, used to adapt the motion range or contigency motion? Remember CO 4 CLO 14 AME553.14 7 What is slew motion? Siew motion it is simplets type onther at default speed. Performs without any calculations so it of nel leads to unanticipated results and wear on the robot joint Remember CO 4 CLO 16 AME553.15 8 What is joint interpolated mo		What are	constraints that can be expressed				
constraints?angles, these include bounds on ispin angles, avoidance of self-collision and of collision with obstacles, etc. These constraints can thus be fully taken into account in the path optimizationRememberCO 4CLO 15AME553.153What is role of optimizationOptimization comes into play when there are more than one path or trajectory that allow activity the constraints. It is then interesting to select the path or trajectory generation is in common usage in robotics or porvide smooth, continuous motion from one set of n joint angles to another, for instance, for moving between two distinct cartesian poses for which the inverse pose solution has obstacle avoidance. The obstacle avoidance is to collisions with the obstacles detected by the sensors during motion executionRememberCO 4CLO 16AME553.166What is there advantage of reactive obstacle avoidance?A complementary way to obstacle avoidance. The objective is to move a vehicle towards a targel location free of collisions with the obstacles detected by the sensors during motion executionRememberCO 4CLO 13AME553.147What is here avoidance?Out adopt introducing incompatible with initial plans.Remember optication free of collisions with the obstacles detected by the sensors during reactive obstacle avoidance?CO 4CLO 16AME553.147What is joint interpolated motion?Joint-interpolated motion requires the robot controller of notion?Remember collisions calculations so it often leads to and calculations so it often leads to and calculations on it often leads to <b< th=""><td></td><td>geometric</td><td>solely in terms of the robot joint</td><td></td><td></td><td></td><td></td></b<>		geometric	solely in terms of the robot joint				
images and images avoidance of self-collision and or collision with obstacles, etc. These constraints can thus be fully taken into account in the path planning step. CO.4 CLO.15 AME553.15 3 What is role of optimization comes into play when there are more than one path or trajectory that allow achieving the task while stifying the constraints. It is then interesting to select the path or trajectory that optimizes a given objective. Remember CO.4 CLO.15 AME553.16 4 What is Joint Joint-space trajectory generation to provide smooth, continuous moving between two distinct sets of n joint angles to another, for instance, for moving between two distinct Cartesian poses for which the objective is to move a vehicle two distinct sets of n joint angles CO.4 CLO.16 AME553.13 5 What is the role advantage of reactive obstacle avoidance. The objective is to move a vehicle two distinct sets of n joint angles of reactive of collisions with the obstacle avoidance. The objective is to move a vehicle two distical exolution fractory incompatible with initial plans. CO.4 CLO.14 AME553.14 6 What is the motion carculation free of collisions with the obstacle avoidance is to compute motion by introducing motion execution Remember of CO.4 CLO.16 AME553.14 7 What is slew motion it is simplest type on the radius speed. Performs without any calculations so it of neal avoidance? Slew motion it is simplest type on the radius speed. Performs without any calculatithe time it will tak each foin to reach its d		constraints?	angles, these include bounds on				
self-collision and of collision with obstacles, etc. These constraints can thus be fully taken into account in the path planning step. Remember CL0 15 AME553.15 3 What is role of optimization Optimization comes into play when there are more than one path or trajectory that allow achieving the constraints. It is then interesting to select the path or trajectory generation is in common usage in robotics to provide smooth, continuous motion from one set of a joint agree to provide smooth, continuous motion from one set of a joint agree solution has yielded two distinct Cartesiam poses for which the inverse pose solution has yielded two distinct cartesiam poses for which the inverse pose solution has yielded two distinct cartesiam poses for which the inverse pose solution has yielded two distinct cartesiam poses for which the inverse pose solution has yielded two distinct sets of a iobstacle avoidance? Remember to do bastacle avoidance for collisions with the obstacles detected by the sensors during motion execution the advantage of reacting motion Robot is commanded to travel from one point agree for motion, Robot is commanded to travel from one point avoidance? Remember the advantage of reacting motion execution CO 4 CL0 14 AME553.14 6 What is her advantage of reacting motion? He advantage of reacting the control loop, used to adapt the motion is commanded to travel from one point on the robot joint Remember CO 4 CL0 15 AME553.14 7 What is joint Joint-interpolated motion? Joint-interpolated motion requires the robot controller to unanticipated results and wear on the robot joint Remember CO 4			the joint angles, avoidance of				
with obstacles, etc. These constraints can thus be fully planning step. Remember CI 0 15 AME553.15 3 What is role of optimization Optimization comes into play when there are more than one path or trajectory that alone achieving the task while satisfying the constraints. It is then interesting to select the path or trajectory that optimizes a given objective. Remember CO 4 CLO 16 AME553.16 4 What is Joint Joint-space trajectory generation space Trajectory? Remember CO 4 CLO 16 AME553.16 5 What is the role of obstacle avoidance ? A complementary way to obstacle avoidance. The obstacle avoidance. The obstacle avoidance role collisions with the obstacles detected by the sensors during motion execution free compute motion typication obstacle avoidance is to compute motion by introducing motion execution free compute motion by introducing motion execution free compute motion by introducing motion execution free compute motion by introducing motion raw opingency incompatible with initial plans. Remember CO 4 CLO 13 AME553.13 6 What is slew motion? The advantage of reactive of motion Robot is commanded the control loop, used to adpet of motion. Robot is commanded the motion to any contingency incompatible with initial plans. Remember CO 4 CLO 15 AME553.15 7 What is joint Joint-interpolated motion? Is simplet type of motion Robot is commanded to ravel from one point			self-collision and of collision				
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7What is slew motion?Slew motion it is simplest type of motion. Robot is commanded to travel from one point to another at default speed. Performs without any calculations so it often leads to unanticipated results and wear on the robot jointRememberCO 4CLO 15AME553.158What is joint interpolated motion?Joint-interpolated motion requires the robot controller to calculate the time it will take each joint to reach its destination at the commanded speed.RememberCO 4CLO 16AME553.169What is straight line interpolationStraight-line motion: requires the end of the interpolationRememberCO 4CLO 13AME553.13			the motion to any contingency		10		
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8What is joint interpolated motion?Joint-interpolated calculations at the commanded speed.RememberCO 4CLO 16AME553.169What is straight line interpolationStraight-line motion: requires the end of the interpolationRememberCO 4CLO 13AME553.13		motion?	of motion. Robot is commanded	1			
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8 What is joint interpolated Joint-interpolated motion motion? Remember CO 4 CLO 16 AME553.16 9 What is straight line Straight-line interpolation motion: requires the end of the interpolation Remember CO 4 CLO 16 AME553.16			unanticipated results and wear				
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9 What is straight Straight-line interpolated Remember CO 4 CLO 10 AMESSS.10 9 What is straight Straight-line interpolation Remember CO 4 CLO 13 AMESS3.13	8	What is joint	Ioint_interpolated motion	Remember	CO 4	$CI \cap 16$	AME553 16
9 What is straight interpolation Straight-line end effector to travel along a Remember CO 4 CLO 13 AME553.13	0	interpolated	requires the robot controller to	Kemember	CU 4	CLU 10	AME555.10
9 What is straight interpolation Straight-line end effector to travel along a Remember CO 4 CLO 13 AME553.13		motion?	calculate the time it will take				
9 What is straight Straight-line interpolation Remember CO 4 CLO 13 AME553.13 interpolation end effector to travel along a Interpolation Remember CO 4 CLO 13 AME553.13		monon	each joint to reach its				
9 What is straight line Straight-line interpolation motion: requires the end of the interpolation Remember CO 4 CLO 13 AME553.13			destination at the commanded				
9 What is straight Straight-line interpolation Remember CO 4 CLO 13 AME553.13 line motion: requires the end of the interpolation end effector to travel along a			speed.				
line motion: requires the end of the interpolation end effector to travel along a	9	What is straight	Straight-line interpolation	Remember	CO 4	CLO 13	AME553.13
interpolation end effector to travel along a		line	motion: requires the end of the		201		
		interpolation	end effector to travel along a				

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
	motion?	straight path determine in				
		rectangular xy coordinates.				
10	What is	Circular interpolation motion:	Remember	CO 4	CLO 14	AME553.14
	Circular	requires the robot controller to				
	interpolation	define the points of a circle in				
	motion?	the workplace based on a				
		minimum of three specified				
11	XX71 / ·	positions.	D 1	CO 4	CL 0 17	A MEE 5 2 1 5
11	What is an	It is a robot mechanism that	Remember	CO 4	CLO 15	AME553.15
	actuator?	enables the effector to execute				
12	What are	In a hydraulic actuator a	Remember	CO 4	CL 0 16	AME553 16
12	hydraulic	cylinder or fluid-based motor	Remember	0.04	CLO IU	AML555.10
	actuator?	uses the power of hydraulics to				
	uctuator.	create mechanical action. The	1.1			
		motion can be straight, rotating				
		or oscillating.				
13	What are	Pneumatic With a pneumatic	Remember	CO 4	CLO 13	AME553.13
	pneumatic	actuator, a vacuum or				
	actuator?	compressed air is used to make				
		energy into action. They are				
		good for making a large linear				
		or rotating motion with a small				
		amount of pressure.				
14	What are	Using pulleys, gears, rails and	Remember	CO 4	CLO 14	AME553.14
	mechanical	chains, a mechanical actuator				
	actuators?	converts the rotating motion of				
		physical objects into linear				
		motion. One common example	and the second se			
		is rack and pinion steering				
15	What is servo	The servo motor is most	Remember	CO 4	CLO 15	AME553 15
15	motor?	commonly used for high	Remember	004	CLO IS	71012555.15
		technology devices in the				
	0	industrial application like			- C	
	-	automation technology. It is a				
	0	self-contained electrical device,			4	
	0	that rotate parts of a machine			-	
		with high efficiency and great			100	
		precision.				
		UNIT-V				
1	Define spot-	A spot-welding robot has to	Remember	CO 5	CLO 17	AME553.17
	welding robots	carry the welding oun which				
		consists of the electrodes the				
		cohles which are required to				
		capies which are required to				
		conduct the high current, and				
		sometimes a water-cooling				
		system for the electrodes.		<u> </u>	OT C	
2	What are the	The spray painting robots has	Remember	CO 5	CLO 18	AME553.18
	characteristics of	the following characteristics :				
	spray painting	(a) high level of manipulator				
	nobota?	dexterity (b) large working				
	robots?	denterity, (b) harge working				
	TODOLS ?	volume for small-base				
	TODOLS ?	volume for small-base manipulator,				

S.No	QUESTION	ANSWER	Blooms Level	СО	CLO	CLO Code
		(d) small payload, and				
		(e) low accuracy and				
		repeatability.				
3	Define Interlock.	Interlocks provide means of	Remember	CO 5	CLO 19	AME553.19
		preventing the work cycle				
		sequence from continuing unless				
		a certain or set of conditions are				
		satisfied.				
4	Classify work	There are 3 types of work part	Remember	CO 5	CLO 20	AME553.20
	part transport	transport system used in in-line				
	system used in	robot work cell.				
	in-line robot	1. Intermittent Transfer.				
	work cell.	2. Continuous Transfer.	1			
		3.Non-Synchronous Transfer				
5	Define	The parts are moved in a start-	Understand	CO 5	CLO 17	AME553.17
_	intermittent	and-stop motion from one				
	transfer	station to another along the line				
	d'unision.	It is also called synchronous				
		transfer since all parts are				
		moved simultaneously to the				
		next stop. The advantage of this	1			
		system is that the parts are				
		registered in a fixed location and				
		orientation with respect to the	_			
		rebet during rebet's work cycle				
6	Define	Work parts are moved	Understand	CO 5	CL 0 18	AME553 18
0	continuous	continuously along the line at	Onderstand	005		AML555.10
	transfer	constant speed. The robot(s) has			() () () () () () () () () ()	
	d'unificit.	to perform the tasks as the parts				100
		are moving along The position				
	0	and orientation of the parts with			- C	>
		respect to any fixed location				
		along the line are continuously			A	
		changing				
7	Classify work	1 Sequence control	Understand	CO 5	CLO 19	AME553 19
,	cell control	2 Operator interface	Chaorbhana	005	010 17	1111111111111111
	con control.	3. Safety monitoring			(C)	
8	Define input	Input interlocks make use of	Understand	CO 5	CLO 20	AME553.20
-	interlocks.	signals sent from the				
		components in the cell to the	1			
		controller.				
9	Define Part	It there are more than one type	Understand	CO 5	CLO 17	AME553.17
	Identification	of parts, there will be a necessity				
	problem	to identify various parts by				
	proceeding	automated means suct as optical				
		techniques magnetic techniques				
		or limit switches that sense				
		different sizes or geometry				
10	How do you	In applications such as spray	Understand	CO 5	CLO 18	AME553 18
10	nrotect robot	nainting hot metal working	Chaoistana	005		
	from its	conditions abrasive				
	environment?	applications adhesive sealant				
1 1	en , nonnont :	approventions, autobive souldit				

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code		
		applications, the robot has to be						
		protected from possible adverse						
		environment. (e.g. use of						
		sleeves. long grippers).						
11	Define mobile	In this arrangement, the robot is	Remember	CO 5	CLO 19	AME553 19		
	work cell.	provided with a means of	rteineineer	005	010 17	11111111111111111		
		transport, such as a mobile base.						
		within the work cell to perform						
		various tasks at different						
		locations.						
12	What is non-		Remember	CO 5	CLO 20	AME553.20		
	synchronous	This is a power and free						
	transfer system.	system". Each work part moves						
		independently of other parts. in						
		a stop-and-go manner.						
					21 0 1 2			
13	Define repetitive	If the sequence of elements in	Remember	CO 5	CLO 17	AME553.17		
	work cycle.	the work cycle is the same, and						
		the elements consist of relatively						
		simple motions, robots usually						
		perform the work with greater						
		then humans						
14	What is Multi	A robot can replace two or three	Remember	CO 5	CLO 18	AME553 18		
14	shift operation	workers at a time in second or	Kemember	05	CLO 10	AME555.18		
	sint operation.	third shifts thus they can						
		provide a faster financial						
		pavback.	-					
15	Define Infrequent	Robots' use is justified for long	Remember	CO 5	CLO 17	AME553.17		
	changeovers.	production runs where there are			- C	S		
		infrequent changeovers, as			-			
		opposed to batch or job shop			4			
		production where changeovers						
		are more frequent.			1			
Signature of the Faculty HOD, ME								

Signature of the Faculty