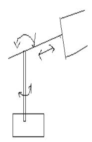
Program: BE Biomedical Engineering
Curriculum Scheme: Revised 2016
Examination: Final Year Semester VIII
Course Code and Course Name: BMDLO8042 and Robotics in Medicine

Time: 1 hour Max. Marks: 50

==

1		Which of the below is a set of Minor axes of robot
	a	Base,Elbow
	b	Shoulder,Elbow
	c	Base,Shoulder
	d	Yaw,Pitch
2		Stroke of a robot is
	a	Distance between min and max reach
	b	reach
	c	Min reach
	d	orientation
3		Which is not a classification of robot based on drive technology
	a	Electric Drive Robot
	b	Hydraulic Robot
	c	PUMA Robot
	d	Pneumatic Robot
4		Axes of robot beyond 6 are considered for
	a	Major axes
	b	Minor axis
	c	Obstacle avoidance
	d	Coordinate transformation
5		Yaw,Pitch and Roll are
	a	Major axis
	b	Minor axis
	c	Shoulder
	d	Elbow
6		Soft drink bottling plant is example of
	a	Hard automation
	b	Soft automation
	c	Programmable Automation
	d	Flexible automation
7		Pneumatic drives use---power for driving robot
	a	Air activated tools
	b	Water activated tools
	c	Electric Motors
	d	DC Motors
8		Robot gripper used for handling delicate objects uses
	a	Pneumatic gripper

	b	Water activated gripper
	c	Electric Motors
	d	DC Motors
9		No of axis in SCARA is
	a	1
	b	2
	c	3
	d	4
10		Which robot is not considered in classification of robots based on physical configuration?
	a	Cylindrical robot
	b	Polar robot
	c	PTP robot
	d	Cartesian robot
11		The following figure represents a type of__ 
	a	Cartesian robot
	b	Cylindrical robot
	c	S C A R A robot
	d	Spherical robot
12		What is the name for information sent from robot sensors to robot controllers?
	a	temperature
	b	pressure
	c	feedback
	d	signal
13		Which robot has work space envelop a rectangular box
	a	Cylindrical robot
	b	Spherical robot
	c	Cartesian Robot
	d	SCARA
14		The Kinematic part of the robot which can be varied for manipulation is called
	a	Manipulator
	b	Joint parameter
	c	Link parameter
	d	End effector
15		Pneumatic drives use---power for driving robot

	a	Air activated tools	
	b	Water activated tools	
	c	Electric Motors	
	d	DC Motors	
16		Shape of workspace of spherical robot is	
	a	Rectangular box	
	b	Hemisphere	
	c	Cylinder	
	d	Circle	

17		Joint variable in rotary joint is	
	a	Link length	
	b	Link twist angle	
	c	Joint distance	
	d	Joint angle	
18		Screw matrix due to link parameters are about	
	a	X axis	
	b	Y axis	
	c	Z axis	
	d	Link axis	
19		To find link length we	
	a	Translate along X direction	
	b	Translate along Z direction	
	c	Rotate about X direction	
	d	Rotate about Z direction	
20		Which axis is fixed to complete RHOCF while assigning coordinate frames using DH algorithm	
	a	x	
	b	y	
	c	z	
	d	X and y	
21		Pass 2of DH algorithm gives	
	a	KP Table	
	b	LCD	
	c	Arm Matrix	
	d	Kinematic Parameters	
22		Joint distances for two axis planar robot is	
	a	5	
	b	6	
	c	0	
	d	3	
23		Z axis at tool tip is along	
	a	Normal Vector	
	b	Sliding Vector	

	c	Approach Vector	
	d	Joint length	
24		Which one is a Screw transformation of joint parameter	
	a	Rot(θk,3)*Tran(dk,3)	
	b	Rot(θ,3)*Rot(λ,3)	
	c	Rot(θ,2)*Tran(λ,3)	
	d	Rot(θ,3)*Tran(λ,2)	
25		Perspective vector is in which row of HCTM	
	a	1	
	b	2	
	c	3	
	d	4	
26		Rotation matrix R1(θ) for a rotation of θ=π/2 with respect to f1 axis is	
	a	[1 0 1;1 0 0;0 0 1]	
	b	[1 0 0;0 0 -1;0 1 0]	
	c	[1 0 0;0 1 0; 0 0 1]	
	d	[0 0 1;0 1 0 ;1 0 0]	
27		Rotation matrix R2(θ) for a rotation of θ=π/2 with respect to f2 axis is	
	a	[0 0 1;0 1 0;-1 0 0]	
	b	[1 0 0;0 0 -1;0 1 0]	
	c	[1 0 0;0 1 0; 0 0 1]	
	d	[0 0 1;0 1 0 ;1 0 0]	
28		A homogeneous matrix with only translation of -2 in z direction is	
	a	[1 0 0 0;0 1 0 0;0 0 1 -2; 0 0 0 1]	
	b	[1 0 0 -1;0 1 0 -2;0 0 1 -10; 0 0 0 1]	
	c	[1 0 0 0;0 1 0 -2;0 0 1 -2; 0 0 0 1]	
	d	[1 0 0 -2;0 1 0 0;0 0 1 -2; 1 0 0 1]	
29		Equation for composite rotation matrix if YPR rotations are done is	
	a	C(Θ)=R1(Θ)*R2(Θ)*R3(Θ)	
	b	C(Θ)=R1(Θ)+R2(Θ)+R3(Θ)	
	c	C(Θ)=R1(Θ)+R2(Θ)/R3(Θ)	
	d	C(Θ)=R1(Θ)+R2(Θ)	
30		Rhino XR3 has joints which are	
	a	All prismatic	
	b	All revolute	
	c	Prismatic and revolute	
	d	2 prismatic and 3 revolute	
31		Rotation matrix R2(θ)for the rotation about f3 axis is	
		[cos(θ) -sin(θ) 0;sin(θ) cos(θ) 0 ;0 0 1]	
		[1 cos(θ) 0;0 cos(θ) -sin(θ);0 sin(θ) cos(θ)]	
		[1 cos(θ) -sin(θ);0 1 0;0 sin(θ) cos(θ)]	
		[cos(θ) 0 sin(θ); 0 1 0 ;-sin(θ) 0 cos(θ)]	

32		Rotation matrix R1(θ) for a rotation of θ=π/2 with respect to f3 axis is	
		[0 1 0;1 0 0;0 0 1]	
		[1 0 0;0 0 1; 0 1 1]	
		[1 0 1; 0 0 1; 1 1 -1]	
		[0 1 1;1 0 0; 1 0 0]	
33		The most general method for solving Inverse Kinematic Problem is	
	a	Numerical Method	
	b	Vector method	
	c	Graphical Method	
	d	Analytical Method	
34		Calculation of TCV is used in which method of solving Inverse Kinematic Problem	
	a	Numerical Method	
	b	Vector method	
	c	Graphical Method	
	d	Analytical Method	
35		Tool configuration vector is	
	a	2 element column vector	
	b	3 element column vector	
	c	4 element column vector	
	d	6 element column vector	
36		Last three elements of TCV are	
	a	Scaled approach vector	
	b	Position	
	c	Amplitude	
	d	Direction	
37		TCV=[w^1 w^2] what is w^1	
	a	Orientation vector	
	b	Position vector	
	c	Amplitude	
	d	Direction	
38		Tools used to hold sub part in proper position are	
	a	Conveyor	
	b	Carousal	
	c	Gravity Part feeder	
	d	Fixed Tools	
39		Which of the following is a workspace fixture	
	a	Fixed Tool	
	b	Microboat Alpha	
	c	Rhino XR3	
	d	SCARA	
40		Maximum Horizontal reach of SCARA is	

	a	a1+a2	
	b	$a1^2+a2^2$	
	c	a1	
	d	a2	
41		What does [qkmin≤ C*qk≤ qkmax] represent	
	a	Kinematic equation	
	b	Inverse kinematics	
	c	JSWE equation	
	d	Rotation Matrix	
42		Work Envelop traced by Joints of the robot is	
	a	Total work Envelop	
	b	Joint Space Work Envelop	
	c	Dextrous Work Envelop	
	d	Trajectory	
43		In PNP Trajectory lift off point is	
	a	Near to place ponit	
	b	Near to pick ponit	
	c	Not on PNP Trajectory	
	d	Pick point	
44		Cartesian space trajectories will trace	
	a	End effectors trajectory	
	b	Trajectory of joints	
	c	Pick and place	
	d	Path	
45		**In which of the following operations Continuous Path System is used**	
	a	Pick and Place	
	b	Loading and Unloading	
	c	Continuous welding	
	d	Bottling Plant	
46		In trajectory planning Bounded deviations method is an effective technique for	
	a	Selecting knot points	
	b	Selective speed	
	c	Selecting path	
	d	Selecting polynomial coefficients	
47		A general straight line trajectory for the tool in terms of initial point w^0 ,final point w^1 in the tool configuration space and differential speed distribution function s(t) is given by	
	a	$w(t) = [1 – s(t)]w^0 +s(t)w^1$	
	b	$w(t) = [1 + s(t)]w^0 +s(t)w^1$	
	c	$w(t) = [s(t)w^0 +s(t)w^1$	

	d	$w(t) = s(t)w^1$	
48		Which one of the following is a robot trajectory function	
	a	Sinusoidal function	
	b	Linear function with parabolic blends	
	c	A pure linear function	
	d	A triangular function	

49		A method for checking whether a given part belongs to a class of objects	
	a	Line descriptor	
	b	Area Descriptor	
	c	Region Growing	
	d	Template matching by Performance Index	
50		Which of the following is a method for edge detection	
	a	Shrink Operator	
	b	Swell Operator	
	c	Sobel Operator	
	d	Normalized Cross Correlation	
51		Swell Operator is iterative process used in images if	
	a	isolated background pixel is there in foreground	
	b	isolated foreground pixel is there in background	
	c	Template matching	
	d	Edge detection	
52		Moments of images are calculated for	
	a	Line descriptor	
	b	Area descriptors	
	c	Object detection	
	d	Iterative processing	
53		Zeroth order moment of an image can be calculated by	
	a	Adding all foreground pixels(1's)	
	b	Adding all background pixels(0's)	
	c	product	
	d	operator	
54		Euler number of number '8 is	
	a	1	
	b	-1	
	c	2	
	d	-2	
55		A transformation which transforms homogeneous coordinates of camera to homogeneous coordinates of image	
	a	Euler number	
	b	Perspective transformation	
	c	Template matching	
	d	Edge detection	

56		Discretizing an image in special coordinates is known as	
	a	histogram	
	b	sampling	
	c	quantization	
	d	coding	
57		Edges can be identified by computing the	
	a	Gradient	
	b	Illumination	
	c	Slope	
	d	Divergence	
58		Robotics Vision is used when the feedback sensor is a	
	a	Proximity Sensor	
	b	Light Sensor	
	c	Camera	
	d	Infrared Sensor	
59		Template Matching can be done using	
	a	Minimum Distance Classifier	
	b	Correlation Based Classifier	
	c	Neural Networks	
	d	Optimum Statistical Classifiers	
60		A Problem associated with Template matching is	
	a	It works well if the two images are the same	
	b	It works well if the two images are of the same size	
	c	It works well if the average intensity of the two images is the same	
	d	It works well if the mean of the two images is the same	
61		The maximum value of normalized cross correlation function σ(x,y) is	
	a	Infinity	
	b	2	
	c	0	
	d	1	
62		What is role of camera in robotic vision?	
	a	Charge coupled device for image acquisition	
	b	Computer connected device	
	c	Calculated correction drive	
	d	Image	
63		Image processing approaches operating directly on pixels of input image work directly in	
	a	Transform domain	
	b	Spatial domain	
	c	Inverse transformation	
	d	Kinematic domain	

64		A method which separates background and foreground of image is	
	a	Edge detection	
	b	Template matching	
	c	Chain Code	
	d	Histogram	
65		What is the set of pixels of 8-neighbors of pixel p at coordinates (x, y)?	
	a	(x+1, y), (x-1, y), (x, y+1), (x, y-1), (x+2, y), (x-2, y), (x, y+2), (x, y-2)	
	b	(x+1, y), (x-1, y), (x, y+1), (x, y-1), (x+1, y+1), (x+1, y-1), (x-1, y+1), (x-1, y-1)	
	c	(x+1, y+1), (x+1, y-1), (x-1, y+1), (x-1, y-1), (x+2, y+2), (x+2, y-2), (x-2, y+2), (x-2, y-2)	
	d	(x+2, y), (x-2, y), (x, y+2), (x, y-2), (x+2, y+2), (x+2, y-2), (x-2, y+2), (x-2, y-2)	
66		Euler number of swollen image is always ---------Euler number of original image	
	a	Less than or equal to	
	b	Greater than or equal to	
	c	Always Equal to	
	d	Not affected	
67		Centroid (xc,yc)of a region is given by	
	a	(m00/m01;m00/m10)	
	b	(m10/m00;m01/m00)	
	c	(m10/m01;m01/m10)	
	d	(m01/m00;m10/m00)	
69		Area of the foreground region is given by	
	a	0^{th} order moment	
	b	1^{st} order moment	
	c	2^{nd} order moment	
	d	Central moment	
70		A sequence of numbers m_{kj} which are used to characterize the shape of foreground in an image is	
	a	Moment	
	b	Run length encoding	
	c	Template matching	
	d	Euler number	
71		Run Length encoding for the given binary image I=[0 1 1 1;1 1 1 1;1 0 0 0;0 0 0 0] is	
	a	1,0,7,8	
	b	0,0,1,7,0,0	
	c	0,1,8,7	
	d	0,0,1,5,0,6	

72		Chain code for the given object in image I=[0 1 1 0;0 1 0 1;0 1 1 0;0 0 0 0]	
	a	3,4,6,6,0,1	
	b	4,6,3,0,1	
	c	6,6,0,1,3,4	
	d	1,0,3,4,6,6	
73		Find the zeroth order moment of the given image I=[1 0 1 1;0 1 1 1;1 1 0 0;1 0 0 0]	
	a	9	
	b	7	
	c	6	
	d	5	

74		Configuration Space method is for --------motion planning	
	a	Fine	
	b	Gross	
	c	Grasp	
	d	Work envelop	
75		Guarded motion is associated with---------motion planning	
	a	Fine	
	b	Gross	
	c	Grasp	
	d	Work envelop	
76		Safe grasp planning is a part of	
	a	Motion planning	
	b	Inverse kinematics	
	c	Compliance	
	d	Kinematics	
77		Finding collision free way of motion planning is in	
	a	Configuration space	
	b	GVD	
	c	Grasping	
	d	Reachable grasping	
78		Leading the robot to the final desired position is done by	
	a	Lead through programming	
	b	Text programming	
	c	High level programming	
	d	C++	
79		Programming the robot when it is disconnected from working system then it is	
	a	Off line Programming	
	b	Online Programming	
	c	Trajectory Programming	
	d	Java Programming	

80		Which of the following is not a part of path planning	
	a	Gross motion planning	
	b	Fine Motion Planning	
	c	Grasp Planning	
	d	Perspective	
81		Surgical cuts in microsurgery are smaller than with traditional open surgery. Benefits include:	
	a	Faster recovery; Less pain and bleeding	
	b	Cheap	
	c	Complicated	
	d	More hospital stay	
82		Da Vinci Robot is	
	a	Pick and Place Robot	
	b	Point to Point Robot	
	c	SCARA	
	d	Surgical Robot	