

Hall Ticket Number:

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

Code No. : 13165 N (E)

**VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD***Accredited by NAAC with A++ Grade***B.E. III-Semester Main Examinations, Jan./Feb.-2024****Introduction to Industrial Robotics (OE-I)**

Time: 3 hours

Max. Marks: 60

*Note: Answer all questions from Part-A and any FIVE from Part-B**Part-A (10 × 2 = 20 Marks)*

Q. No.	Stem of the question	M	L	CO	PO
1.	Define the term 'industrial robot'.	2	1	1	1
2.	Sketch configuration of SCARA manipulator.	2	1	1	1
3.	List the practical situations where robot end effector can be used as a tool.	2	1	2	1
4.	What are various robot joints?	2	1	2	1
5.	A movable coordinate frame OUVW is moved with respect to a fixed frame OXYZ. Can this information be represented using a rotation matrix? Why (Why not)?	2	2	3	1
6.	A point $P = [2, -5, 9]^T$ is represented in movable frame OUVW. Calculate the coordinates of the point in fixed frame OXYZ, if OUVW is rotated with respect to Z axis by 60 degrees.	2	2	3	2
7.	What is the basic difference between proximity sensor and range sensor?	2	1	4	1
8.	What is the purpose of an external sensor?	2	1	4	1
9.	What are the advantages of parallel manipulators over serial manipulators?	2	1	1	1
10.	When do you use Pre and Post multiplication of matrices for representing composite transformations.	2	1	2	1
<b>Part-B (5 × 8 = 40 Marks)</b>					
11. a)	Explain the configuration of the following manipulators: (i) Cartesian (ii) cylindrical (iii) articulated (iv) polar.	4	3	1	1
b)	Discuss the applications of robots in material handling.	4	3	1	1
12. a)	Explain the working principle of any electrical actuator with a neat sketch. Also mention its advantages.	4	2	2	1
b)	Sketch and explain any two position feedback devices.	4	2	2	1
13. a)	Explain the concept of Euler angles in detail.	4	3	3	1
b)	Derive the Rotation matrix for an Industrial Robot.	4	3	3	2
14. a)	Explain operation and working principle of Hall effect sensor with neat sketches.	4	2	4	1
b)	Explain online programming used in robotics with suitable examples.	4	2	4	1

Contd... 2

180

15. a)	How the industrial robots are specified? Explain with suitable examples.	4	3	1	1
b)	Compare the merits and demerits of hydraulic and pneumatic actuators.	4	2	2	1
16. a)	Explain RPY angle representation and derive overall composite rotation matrix.	4	3	3	1
b)	Discuss the working principle of tactile sensor.	4	2	4	1
17.	Answer any <i>two</i> of the following:				
a)	Discuss the applications of robots in assembly and inspection.	4	3	1	1
b)	Explain various types of mechanical actuation used in robot end effectors with neat sketches.	4	3	2	1
c)	Explain the significance of different parts of homogeneous transformation matrix.	4	3	3	1

M : Marks; L: Bloom's Taxonomy Level; CO; Course Outcome; PO: Programme Outcome

i)	Blooms Taxonomy Level - 1	20%
ii)	Blooms Taxonomy Level - 2	35%
iii)	Blooms Taxonomy Level - 3 & 4	45%

\*\*\*\*\*

4

R-205