Code No: RT32034 **R13** SET - 1

III B. Tech II Semester Supplementary Examinations, November-2022
ROBOTICS
(Mechanical Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answering the question in **Part-A** is compulsory
3. Answer any **THREE** Questions from **Part-B**

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PART –A **(22 Marks)**

1.	a)	What are the material handling applications of robot?	[3M]
	b)	Define degrees of freedom. Mention its importance in robotics.	[4M]
	c)	Explain forward and inverse kinematic transformations of robots.	[4M]
	d)	Define singularities. Explain external and internal singularities.	[4M]
	e)	Explain why path planning is required for a robotic system.	[4M]
	f)	Discuss the working principle of hydraulic actuators.	[3M]

PART –B **(48 Marks)**

2.	a)	What are the different workspace configurations? Explain with neat diagrams.	[8M]
	b)	What is the future scope of robotics? Explain.	[8M]
3.	a)	With the help of line diagram explain basic components of a robot system.	[8M]
	b)	List the advantages and disadvantages of pneumatic manipulators.	[8M]
4.	a)	Explain the implementation of DH notation for a links coordinate system and joint parameters.	[8M]
	b)	Write notes on the following: (i) Euler angles (ii) RPY representation	[8M]
5.	a)	Define and explain a geometric Jacobian.	[8M]
	b)	For R-P-R arm manipulator, obtain Jacobian to express the Cartesian velocities in terms of Joint velocities.	[8M]
6.	a)	What are the interlock and sensor statements used for industrial robots? Explain.	[8M]
	b)	A point-to-point robot with a revolute joint moving with velocity of 15 deg/sec, traverses from an initial position of 12 degrees to a final position of 60 deg/sec. Determine the position and velocity at the end of 1, 2 and 3 seconds. The range of initial and final position is covered in 6 seconds with a finite acceleration of 8 deg/sec^2.	[8M]
7.	a)	Explain the applications of robots in continuous arc welding and spray painting.	[8M]
	b)	Explain the operation of optical encoder used in robot as a feedback device.	[8M]

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