Name:

Enrolment No:

UPES

End Semester Examination, December 2024

Course: Fundamentals of Robotics **Semester : V**

Program: B.Tech (Biomedical Engineering) **Duration : 3 Hours**

Course Code: ECEG3075 **Max. Marks: 100**

Instructions: 1. Make a neat and clean sketch/diagram if needed**.**
2. Be specific and precise in your answers.

S. No.	Section A Short answer questions/ MCQ/T&F (20Qx1.5M= 30 Marks)	Marks	COs
Q 1	Differentiate between manipulator and robot.	1.5	CO1
Q 2	Write the key applications of robot in healthcare.	1.5	CO1
Q 3	Define inverse kinematics of robot.	1.5	CO2
Q 4	Write the major barriers for robot in healthcare system.	1.5	CO1
Q 5	Expand the term 'MIS' and its significance in medical surgery.	1.5	CO1
Q 6	Enlist the different tracking devices used in healthcare.	1.5	CO1
Q 7	Enlist the advantages of robotic surgery.	1.5	CO1
Q 8	Define robotic catheter.	1.5	CO1
Q 9	Write the importance of robot compatibility in medical imaging.	1.5	CO1
Q 10	Write the ethical concerns in medical robotics.	1.5	CO3
	Answer True/False		
Q 11	A Planar Manipulator with More than 3 DOF is called Redundant Manipulator. True/False	1.5	CO2
Q 12	The spherical coordinate system has one prismatic and two revolute joints. True/False	1.5	CO1
Q 13	In serial configuration a sequence of joints and links, where each joint is connected in a series, typically used in robotic arms. True/False	1.5	CO2
Q 14	Colorectal Surgeries can be performed using MIS. True /False	1.5	CO1
Q 15	Port placement in minimally invasive surgery (MIS) is crucial for optimal access, but it does impact the range of motion of surgical instruments. True/False	1.5	CO1

Q 16	In Endoscopy, a flexible tube with a light and camera is inserted through a small incision. True/False	**1.5**	**CO1**
Q 17	MRI is not commonly used in image-guided interventions because it provides real-time imaging with no radiation exposure. True/False	**1.5**	**CO1**
Q 18	CT imaging is often used in real-time for surgical procedures due to its low radiation and quick processing time. True/False	**1.5**	**CO1**
Q 19	Autonomous robotic surgery has been fully implemented in hospitals and is routinely used for complex procedures. True/False	**1.5**	**CO2**
Q 20	Robotic catheters used in heart electrophysiology offer enhanced navigation precision and stability compared to manual techniques. True/False	**1.5**	**CO1**
Section B (4Qx5M=20 Marks)			
Q 21	Explain the different types of sensors used in robots.	**5**	**CO1**
Q 22	Write the advantages and limitations of minimal invasive surgery.	**5**	**CO1**
Q 23	Explain the virtual and augmented reality with examples for medical applications.	**5**	**CO1**
Q 24	Briefly explain the Autonomous robotic surgery.	**5**	**CO2**
Section C (2Qx15M=30 Marks)			
Q 25	Define and discuss the importance of port placement in minimal invasive surgery. Explain the various port placement configurations. **OR** Explain the minimal invasive surgery (MIS) process in detail. Also discuss the key techniques which are performed using MIS.	**15**	**CO3**
Q 26	Define robot coordinate systems. Explain the various robot coordinate systems with the help schematic in detail.	**15**	**CO2**
Section D (2Qx10M=20 Marks)			
Q 27	Discuss the advancements needed for autonomous robotic surgery to become a feasible option in the clinical setting.	**10**	**CO3**
Q 28	Describe the remote center of motion (RCM). Differentiate between mechanical and virtual RCM mechanisms with examples.	**10**	**CO2**