

School of Aeronautics (Neemrana)

I-04, RIICO Industrial Area, Neemrana, Dist. Alwar, Rajasthan

Approved by Director General of Civil Aviation, Govt. of India, All India Council for Technical Education
Ministry of HRD, Govt of India & Affiliated to Rajasthan Technical University, Kota & BTU, Bikaner Rajasthan

Question Paper For Internal Assessment Examination (Theory) - Credit 3 / 37 /

Instructions For Students / Faculty Mid Term I (Total 60 Marks, 2 HRS. Syllabus From Beginning Of Session)

• Part A: Total number of questions to be given are five, each carrying 3 marks and are compulsory to attend. There is no choice. They are short answer type questions (**Not More Than 25 Words For Both Question & Answer**), no objective type or fill in the blanks. Total 15 marks.

• Part B: Total number of questions to be given are six, out of which student has to answer any four. They are long answer type (**Not More Than 50 Words For Question**), each carrying 6 marks. Total 24 marks.

• Part C: Total number of questions to be given are four, out of which student has to answer any three. They are numerical answer type / fully elaborative type (**Not More Than 70 Words For Question**)*, each carrying 7 marks. Total 21 marks.

Mid Term II & III (Total 90 Marks, 2.5 HRS. Syllabus From Beginning Of Session)

• Part A: Total number of questions to be given are ten, each carrying 2 marks and are compulsory to attend. There is no choice. They are short answer type questions (**Not More Than 25 Words For Both Question & Answer**), no objective type or fill in the blanks. Total 20 marks

• Part B: Total number of questions to be given are seven, out of which student has to answer any five. They are long answer type (**Not More Than 50 Words For Question**), each carrying 6 marks. Total 30 marks.

• Part C: Total number of questions to be given are five, out of which student has to answer any four. They are numerical answer type / fully elaborative type (**Not More Than 70 Words For Question**)*, each carrying 10 marks. Total 40 marks.

* **LIST OF ELABORATIVE THEORY QUESTION SUBJECTS:** 3 MH4 - 07 Manufacturing Process, 4 AN4 - 06 Aircraft Materials and Processes (Cr 3), 5 AN4 - 05 Aircraft System (Cr 3), 6 AN4 - 05 Avionics-I (Cr 3), 6 MH4 - 03 Applied Hydraulics & Pneumatics (Cr 3), 6 MH5 - 11 Principles of Management (Cr 3), 6 MH5 - 13 Aircraft Electronics System (Cr 3), 7 AN5 - 12 Maintenance of Airframe and System (Cr 3), 7 AN5 - 13 Helicopter Theory (Cr 3), 7 AG6 - 60.1 Human Engineering and Safety (Cr 3), 7 ST - 01 Avionics II (Special Theory Subject) (Cr 3), 7 MH5 - 11 Design of Mechatronics Systems (Cr 3), 7 MH5 - 12 Robotics and Machine Vision System (Cr 3), 7 MH6 - 13 Medical Electronics (Cr 3), 7 AN6 - 60.1 Aircraft Avionic System (Cr 3), 8 AN5 - 12 Maintenance of Power Plant and System (Cr 3), 8 AN5 - 13 Unmanned Aerial Vehicles & Systems (UAV) (Cr 3), 8 MH5 - 13 Product Development & Launching (Cr 3), 8 EC6 - 60.2 Robotics and control (Cr 3)

FACULTY MEMBERS, PLEASE ENSURE EXCEPT ABOVE LISTED SUBJECTS, NO THEORITICAL ELABORATIVE QUESTION SHOULD BE GIVEN IN PART 'C' OF QUESTION PAPER

Question Paper & Student Details

Mid Term	Mid Term 2	Date of Submission	03/09/2020
Name of Faculty	Ms. Varsha	Date of Examination	09/09/2020
Course	B.Tech (Mechatronics Engineering)	Semester	SEMESTER : 7
Batch	Third (3)	Subject	7 MH5 - 12 Robotics and Machine Vision System (Cr 3)


COURSE OUTCOMES FOR REFERENCE TO FRAME QUESTION PAPER

(Faculties are required to mention relevant Course Outcome number against the respective question in QP)

Course Outcome	1) To derive the kinematics for robot manipulators including direct and inverse kinematics. 2) To analyze robot dynamics for control of serial links for robot manipulators. 3) To give an account of the basic theories of machine vision and image processing. 4) To apply robotics and visual sensing technologies to engineering applications.		
Email I'd	varsha@soaneemrana.org	Phone No.	935-106-2262
Student Name		Student Reg No.	

Part A			
Question : 1	What are different factors which affect the gripper force?		
14	Gripper force	Industrial Robotics edited by P. Jaganathan, Chapter 3, Page no. 3.28-3.40	1

Question : 2	What is the physical significance of Repeatability of robot?		
4	Resolution –Repeatability of robot	Fundamentals of robotics analysis and control edited by Robert J. Shilling, Chapter 1, Page no. 11-20	1
Question : 3	How do we achieve higher grip force with a smaller gripper?		
15	Other types of gripper	Industrial Robotics edited by P. Jaganathan, Chapter 3, Page no. 3.10- 3.15	1
Question : 4	What is the use of Elliptical wave generator in Harmonic Drive?		
7	Harmonic Drive	Industrial robotics edited by P. Jaganathan , Chapter 2, Page no. 2.34-2.40	2
Question : 5	What do you mean by Reverse kinematics of robot ,Explain with example?		
18	Homogeneous transformation	Industrial Robot edited by P. Jaganathan , Chapter 6, Page no. 6.1- 6.8	1
Question : 6	What are the classification of Robots based on control system?		
2	Classification of Robots	Fundamentals of robotics analysis and control edited by Robert J. Shilling, Chapter 1, Page no. 1-30	2
Question : 7	What do you mean by forward Kinematics, Explain with example?		
19	Forward kinematics	Industrial Robotics edited by P. Jaganathan, Chapter 6, Page no 6.8 - 6.12	1
Question : 8	Explain work space accuracy and precision with the help of example?		
3	Work space accuracy	Fundamentals of robotics analysis and control edited by Robert J. Shilling, Chapter 2, Page no. 40-70	2
Question : 9	What do you meant by degeneracy?		
22	Manipulator Dynamics	Industrial Robotics edited by P. Jaganathan, Chapter 11, Page no 11.15- 11.27	2
Question : 10	What do you mean by Forward Newton Euler formulation?		
24	Newtons-Euler formulation	Fundamental of Robotics by Robert J Shilling, Chapter 6, Page no 221- 230	2
Part B			
Question : 1	Explain the industrial application of vision controlled robotics system?		
25	MACHINE VISION FUNDAMENTALS	Industrial Robotics edited by P. Jaganathan, Chapter 5, Page no 5-5.2	3
Question : 2	Explain about the image data reduction?		
26	Digital images-sampling and quantification-levels of computation	Industrial Robotics edited by P. Jaganathan, Chapter 5, Page no 5.24-5.28	3
Question : 3	Explain the feature extraction techniques?		
27	Feature extraction-windowing technique	Industrial Robotics edited by P. Jaganathan, Chapter 5, Page no 5.36-5.45	3
Question : 4	Explain the working of End effector?		
11	Types of End effector	Industrial Robotics edited by P. Jaganathan, Chapter 3, Page no. 3.1- 3.8	1
Question : 5	Discuss about the salient features of different drive systems used in robots?		
9	Effect of other drive system in Robotics	Industrial robot by Mr. V.SENTNILRAJA Chapter 2, Page no. 14-20	1
Question : 6	Derive generalized coordinate and force by the help of Lagrange method?		
23	Lagrange and Euler formulation	Fundamental of Robotics by Robert J Shilling, Chapter 6, Page no 204-228	2
Question : 7	Derive the composite rotation matrix for the rotation about the Cartesian matrix?		

21	Robot Dynamics	Industrial Robotics edited by P. Jaganathan, Chapter 11, Page no 11.1-11.15	2
Part C			
Question : 1	Derive the linear velocity formula and their representation ?		
21	Robot Dynamics	Industrial Robotics edited by P. Jaganathan, Chapter 11, Page no 11.1-11.15	2
Question : 2	Derive the homogeneous equation for RR Robot by inverse Kinematics?		
20	Inverse Kinematic	Industrial Robotics edited by P. Jaganathan, Chapter 6, Page no 6.8 - 6.12	1
Question : 3	Derive homogeneous transformation matrix for translation and rotation X, Y and Z axis of Robot?		
18	Homogeneous transformation	Industrial Robot edited by P. Jaganathan , Chapter 6, Page no. 6.1- 6.8	2
Question : 4	Explain the direction of forces and working principle of cam actuated gear mechanism gripper?		
13	Gripper Mechanism	Industrial Robotics edited by P. Jaganathan, Chapter 3, Page no. 3.22-3.40	2
Question : 5	Drive equation for velocity and acceleration for backward Newton Euler formulation?		
24	Newtons-Euler formulation	Fundamental of Robotics by Robert J Shilling, Chapter 6, Page no 221- 230	2
Upload Scanned Document In Case of Numerical or Diagram For Any of The Above Questions. (Mention question number with relevant fig / numerical / equations. Max 150 KB)			
I have scrutinized the question paper. There is no spelling mistake or any type of irrelevant question.			

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