

Total No. of Printed Pages:2

SUBJECT CODE NO:- H-495
FACULTY OF SCIENCE AND TECHNOLOGY
B.E. (Mechanical)
Robotics and Industrial Automation [Elective-II]
(REVISED)

[Time: Three Hours]

[Max.Marks:80]

N.B Please check whether you have got the right question paper.

- i) Attempt any three (3) questions , from each section.
 ii) Figures to right indicate full marks.

Section – A

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|-----|--|----|
| Q.1 | a) Define following robotics terms
i) Robot
ii) Payload
iii) Reach
iv) Work Envelope
v) End-Effector | 05 |
| | b) Compare Hydraulic & electric drives for Robotic | 04 |
| | c) Give the explanation of VAL II Language for following commands:
i) MOVES
ii) MOVE
iii) MOVEST
iv) MOVET
v) TEACH | 05 |
| Q.2 | a) What are the Types of robot motion? Explain Continuous Path motion with neat sketch. | 05 |
| | b) What are the criteria for classification of Sensor and explain Tactile Sensors. | 05 |
| | c) Explain the following sensor characteristics
(a) Range
(b) Response
(c) Accuracy. | 03 |
| Q.3 | a) Explain working with neat sketch the Image acquisition Charge-Coupled Device for Robot vision. | 05 |
| | b) What are the general considerations in path Description and Generation for Robot Motion? | 05 |
| | c) The Co-ordinate of point $q_{(abc)}$ is given by $(7,5,3)^T$ which is rotated about OX axis of reference frame OXYZ by an angle 60° . Determine the Co-ordinate of point $q_{(x,y,z)}$ | 03 |
| Q.4 | a) Derive the rotation matrix for transformation about X axis | 05 |
| | b) Write short Note on Robot Applications for – Material Handling | 04 |
| | c) Explain the Servo and Non-servo Robot Control System with Block diagrams. | 04 |

- Q.5 a) Write short Note on 06
 (i) Mechanical end effectors
 (ii) Vacuum end effectors
 (iii) Magnetic end effectors
 b) Coordinate of point $P_{(abc)}$ in mobile frame OABC is given by $[4, 3, 2\sqrt{3}]^T$. If the frame OABC is rotated by 60° with respect to OXYZ, find the co-ordinate of P_{xyz} with respect to base frame. 03
 c) Compare joint space versus Cartesian Space for robotic trajectories. 04

Section – B

- Q.6 a) Compare the Fixed and Programmable Automation w.r.t. function, limits and applications. 06
 b) Explain the various reasons for automating as need of time. 04
 c) Explain the Benefits and Limitations of automation. 04
- Q.7 a) Write short note on Industrial Control Applications for Water Treatment Plant 07
 b) What is Sequence and Logic Control for automation. 06
- Q.8 a) Write Note on 07
 i) Automated Guided Vehicle Systems
 ii) Automated Storage/Retrieval Systems
 b) Explain the following PLC Count with one example 06
 i) Count Up
 ii) Count Down
 iii) Reset
- Q.9 a) Compare Logic and Sequence Control with Analog Control with example. 07
 b) Distinguish between Contact vs. Non-contact inspection. 06
- Q.10 a) Explain the Constructional and Working Details of CMM 07
 b) What are Prose and cons of Process industries Verses Discrete-Manufacturing Industries in term of automation. 06