

CS/B.Tech/ME/PE/SEM-8/ME-812/2013

2013

ROBOTICS AND ROBOT APPLICATIONS

Time Allotted : 3 Hours Full Marks : 70

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following :

10 × 1 = 10

- i) The ability of the robot to place the tool tip at an arbitrarily prescribed location in the work envelope is a measure of
- a) Accuracy b) Precision
- c) Repeatability d) Spatial resolution.
- ii) The maximum radial distance the wrist mounting flange can be positioned from the vertical axis about which the robot rotates is known as
- a) Horizontal reach b) Horizontal stroke
- c) Vertical reach d) Vertical stroke.
- iii) Pitch motion enables
- a) Rotation of wrist
- b) Rightward and leftward swivelling movement of the wrist
- c) Up and down movement of the wrist and involves rotational movement as well.
- d) none of these.
- iv) Which of the following configurations has three mutually perpendicular axes ?
- a) Cartesian coordinate configuration

- b) Cylindrical configuration
 - c) Spherical configuration
 - d) None of these.
- v) Relief valves are used for which of the following functions ?
- a) To maintain fluid flow below a predetermined rate
 - b) To maintain pressures above a predetermined level
 - c) To prevent pressure from rising above a predetermined level
 - d) to prevent thermal expansion of the fluids.
- vi) VAL II is a
- a) First generation language
 - b) Second generation language
 - c) World modelling language
 - d) none of these.
- vii) The most common type of electric actuator is
- a) Solenoid b) Relays
 - c) Transistors d) Thyristors.
- viii) The pick-up point is different for each part while the delivery point is fixed in
- a) Palletizing b) Depalletizing
 - c) Stacking d) Sequencing.
- ix) Which component of the fluid power system converts fluid power into mechanical force and motion ?
- a) Pump b) Valve
 - c) Actuator d) Solenoid.
- x) A machine can qualify as a robot subject to which of the following conditions ?
- a) Reprogrammable
 - b) Sensing and perception
 - c) Carry out different tasks
 - d) All of these.

- xi) Prosthesis area of the robotics deals with
- a) Artificial replacement of parts of the human body
 - b) Remote manipulation
 - c) Robot designed to walk on legs
 - d) none of these.
- xii) Which of the following drives is/are clean and quiet with a high degree of accuracy and reliability ?
- a) Pneumatic drives b) Hydraulic drives
 - c) Electrical drives d) All of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. A Cartesian robot has a slide with a total range of 1.2 m and it is desired that it will have a control resolution of 4.6 mm on this axis. Determine the bit storage capacity which the control memory must possess to accommodate this level of precision.
3. The coordinates of a point $P_{abc} = (4, 3, 2)^T$ in the body coordinate frame OABC are rotated through 45° about OZ-axis. Determine the coordinates of the vector P_{xyz} with respect to base reference coordinate frame.
4. What are the causes of robot accidents ? How can they be prevented ?
5. What do you understand by the terms “Workcell” and “Interlocks” ?
6. State the desirable features for Sensors and transducers.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. What do you understand by “sensors based” and “Vision based” inspection ? Explain the various types of justification of robot.

8. State the various reasons and limitations towards adopting 'automation' ? How can 'flexibility' be achieved ? What considerations should be taken into account while making a decision to automate a facility ?

9. Give a comparison between robot-oriented languages and task-level programming languages. State the role played by "Programming support" to a robot language.

10. What are the basic methods of improving robot accuracy ? Explain every method in detail.

11. Explain briefly the following sensors :

a) Synchro

b) Resolver

c) Inductosyn.

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