USN | | | | | | | | | |                                    **18EI644**

## Sixth Semester B.E. Degree Examination, July/August 2022
## Robotics and Automation

Time: 3 hrs.                                                    Max. Marks: 100

**Note:** *Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

1  a. With an illustration, discuss the three classes of industrial automatin. **(10 Marks)**
   b. What is robotics? With neat schematics, briefly discuss the following basic robot configurations.
      i) Polar configuration
      ii) Cylindrical configuration. **(10 Marks)**

### OR

2  a. Explain the following applied to robotics :
      i) Spatial resolution
      ii) Accuracy. **(08 Marks)**
   b. With an illustration, define three degrees of freedom associated with robot wrist. **(05 Marks)**
   c. With a neat block diagram, explain the components of SCADA system. **(07 Marks)**

### Module-2

3  a. For the vector v = 25i + 10j + 20k, perform a translation by a distance of 8 in the x–direction, 5 in the y direction and 0 in the z-direction. Find the translation transformation. **(04 Marks)**
   b. With a neat block diagram, discuss the organization of elements in the robot controller. **(08 Marks)**
   c. Explain the construction and working of the following grippers :
      i) Vacuum cups
      ii) Magnetic grippers. **(08 Marks)**

### OR

4  a. List the factors to be considered for gripper selection and design. **(04 Marks)**
   b. With a schematic, discuss the proximity and range sensors applied to robotics. **(08 Marks)**
   c. State the uses of sensors in robotics. **(08 Marks)**

### Module-3

5  a. With a neat schematic, explain the construction and operation of Vidicon camera. **(08 Marks)**
   b. Discuss the two schemes commonly used for image data reduction. **(06 Marks)**
   c. Describe the two ways of accomplishing lead through programming. **(06 Marks)**

### OR

6  a. With an example program, state the operation of SIGNAL, WAIT and DELAY commands. **(06 Marks)**
   b. What is artificial intelligence? With an illustrate discuss the following search techniques :
      i) Depth – first search
      ii) Breadth –first search. **(08 Marks)**
   c. List the features of LISP program. State the operation of CAR and CDR functions. Give examples. **(06 Marks)**

## Module-4

**7**  a. With a schematic, briefly describe the three categories of transfer systems used with the in-line cell configuration. **(08 Marks)**

 b. Describe the use of interlocks in robotic work cell design. **(04 Marks)**

 c. List the functions that can be accomplished on programmable controller. **(08 Marks)**

### OR

**8**  a. With a neat block diagram, discuss the PLACE system [graphic simulation package]. **(10 Marks)**

 b. With an illustrative schematic, explain the pick – and – place operation. **(10 Marks)**

## Module-5

**9**  a. List and briefly discuss the technical considerations in arc – welding applications. **(04 Marks)**

 b. Discuss the health hazards when spray coating is accomplished manually. **(08 Marks)**

 c. Explain the different parts mating operations in assembly situations. **(08 Marks)**

### OR

**10**  a. What is inspection automation? Explain how robotics can be used to perform inspection operations. **(10 Marks)**

 b. With a neat schematic explain the basic control scheme used for mobile robots. **(10 Marks)**

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