# CBCS SCHEME

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21ME71

## Seventh Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025
## Automation and Robotics

Time: 3 hrs.

Max. Marks: 100

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

### Module-1

1   a.   Illustrate different levels of automation with neat block diagram.          **(10 Marks)**
    b.   Explain advanced automation functions.          **(10 Marks)**

### OR

2   a.   Illustrate the configuration of an adaptive control system in continuous process control.          **(10 Marks)**
    b.   Compare Hydraulic and Pneumatic systems and explain the principles of hydraulic actuators.          **(10 Marks)**

### Module-2

3   a.   What do you understand by an automated flow line? Explain it with the help of a neat sketch and also list the objectives of automated flow line.          **(10 Marks)**
    b.   With examples, explain upper bound and lower bound approaches to analyze automated flow line without storage buffer.          **(10 Marks)**

### OR

4   a.   A 20 station transfer line is divided into two stages of 10 stations each. The ideal cycle time of each stage is $T_C = 1.2$ min. All of the stations in the line have the same probability of stopping P = 0.005. Assume that downtime is constant when a breakdown occurs, $T_d = 8.0$ min. Compute the line efficiency for the following buffer capacities: i) b = 0   ii) b = ∞   iii) b = 10.          **(10 Marks)**
    b.   There are two forms of linear bar codes. Name them, and explain with the sketches. Also compare bar codes and RFID.          **(10 Marks)**

### Module-3

5   a.   Illustrate the Cartesian and cylindrical robotic configurations.          **(10 Marks)**
    b.   Explain robot control systems i.e.   i) Limited sequence     ii) Playback with point-to-point iii) Play back with continuous path control     iv) Intelligent control.          **(10 Marks)**

### OR

6   a.   Define robot end effector. Explain robot accuracy and repeatability.          **(10 Marks)**
    b.   Illustrate pitch, yaw and roll to explain degrees of freedom and also state Asimov's laws of robotics.          **(10 Marks)**

### Module-4

7   a.   Describe how you would use sensors to control the position of a robotic arm.          **(10 Marks)**
    b.   Illustrate the characteristics of DC motors and stepper motors in robotics applications.          **(10 Marks)**

**OR**

8  a. A point $P_{abc} = (2, 3, 4)^T$ has to be translated through distance of +4 units along OX-axis and -2 units along OZ – axis. Determine the co-ordinates of the new point $P_{xyz}$ by homogeneous transformation.  **(10 Marks)**

   b. Explain : i) Direct and inverse kinematics    ii) DH convention.  **(10 Marks)**

## Module-5

9  a. Explain the levels of robotic programming.  **(10 Marks)**

   b. Explain the requirements of robot programming language.  **(10 Marks)**

**OR**

10  a. Explain the following VAL commands with descriptions for:
   i)    Motion control
   ii)   Speed control
   iii)  Position control
   iv)   End effector operation
   v)    Operation of the sensor.  **(10 Marks)**

   b. Write a program in VAL for palletization of parts in a pallet having 4 rows that are 50 mm apart and 6 columns 40 mm apart. The robot must pick parts from an incoming chute and are 25 mm tall. Use in the program the following names for variables ROW, COLUMN, X and Y and use names for location constants PICK-UP, CORNER and DROP.  **(10 Marks)**

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