Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 72119

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Seventh/Eighth Semester

Mechanical Engineering

ME 6010 — ROBOTICS

(Common to Automobile Engineering/ Manufacturing Engineering/ Mechanical and Automation Engineering/ Production Engineering)

(Regulations 2013)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is meant by work Envelope?

2. What is meant by Pay Load capacity of Robot?

3. State the limitations of the Stepper Motor as a drive systems for a Robot.

4. Give the examples of tools used as Robot End Effector.

5. What are the applications of Position Sensors?

6. What is meant by Feature Extraction?

7. State the reasons for homogenous transformation.

8. What are the methods of Robot programming?

9. What is meant by RGV? Where it is used?

10. List out the various methods of Economic Analysis of Robots?

PART B — (5 × 16 = 80 marks)

11. (a) Explain the various configurations of Robot with neat diagram. (16)

Or

(b) Discuss in detail about the functions and need of Industrial Robots. (16)

12. (a) Discuss the salient features, capabilities, applications, merits and limitations of Stepper and Servo Motors. (16)

Or

(b) Discuss the following in detail:

(i) Vacuum Grippers.

(ii) Magnetic Grippers. (8+8=16)

13. (a) What are the basic characters that a sensor should possess? (16)

Or

(b) Discuss how the image segmentation helps to improve the quality of an image in a machine vision system. (16)

14. (a) Describe the Kinematics and dynamics of a Robot. (16)

Or

(b) Discuss about the advantages and disadvantages of lead through programming in detail. (16)

15. (a) Explain the Obstacle detection and avoidance in AGVs. (16)

Or

(b) Explain the factors to be considered for Industrial application of Robots. (16)

Reg. No. : | | | | | | | | | | | | |

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Question Paper Code : 50830

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017
Seventh/Eighth Semester
Mechanical Engineering
ME 6010 – ROBOTICS
(Common to Automobile Engineering/Manufacturing Engineering/Mechanical and Automation Engineering/Production Engineering)
(Regulations 2013)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions.

PART – A (10×2=20 Marks)

1. Draw the revolving and twisting joints.
2. State the laws to qualify as a robot.
3. What is end effector ?
4. List the advantages of stepper motor used in robotics.
5. How time of flight camera works ?
6. What is piezoelectric sensor ?
7. Write a translational matrix of X, Y, Z of a frame.
8. How to calculate degrees of freedom of a serial manipulator ?
9. What are the levels of safety followed in robot work cell ?
10. What is AGV ?

PART – B (5×16=80 Marks)

11. a) With neat sketch explain the 3P, TLO, 3R, 2RP and VRO configuration and discuss the characteristics, work volume and application of each.

(OR)

b) i) Explain the anatomy of serial manipulator and list various parts involved in constructing robot. (8)

ii) What is optical encoder and explain the construction and working different types of optical encoders ? (8)

12. a) Describe the construction and working of following :
    i) Magnetic gripper. (8)
    ii) Vacuum gripper. (8)

(OR)

b) i) With neat sketch, explain the construction and working of hybrid stepper motor. (10)

ii) Write a short note on servomotor with a neat sketch. (6)

13. a) Briefly describe the construction and working of LVDT to measure the linear displacement.

(OR)

b) Explain the following concepts in machine vision systems.
    i) Types of lighting and image sensors. (8)
    ii) Image processing steps involved in machine vision. (8)

14. a) Explain the steps to solve the forward and inverse dynamics of a serial manipulator.

(OR)

b) Derive the forward and inverse kinematic solutions of RR planer manipulator.

15. a) Briefly discuss the safety consideration and its levels of robot in industrial environment.

(OR)

b) i) List the various benefits of adopting AGV in industry. (8)

ii) With a neat sketch explain the construction and uses of teach pendent. (8)

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 91822

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Seventh/Eighth Semester

Mechanical Engineering

ME 6010 – ROBOTICS

(Common to Automobile Engineering/Manufacturing Engineering/Mechanical and Automation Engineering/Production Engineering)

(Regulations 2013)

(Also Common to PTME 6010 – Robotics for B.E. (Part-Time) Seventh Semester – Mechanical Engineering (Regulations – 2014)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions.

PART – A **(10×2=20 Marks)**

1. Represent a vertical reach, horizontal reach and swing of robot.

2. What is robot anatomy ?

3. List the types of stepper motor by construction.

4. A robot has to handle 1 kg load of its two fingered gripper with a coefficient of friction is 0.1. The gripper moves upward with acceleration a = 4 m/s^2. Verify that the safety factor is minimum of 1.536. Calculate the overall gripping force.

5. How does piezoelectric sensor work ?

6. If an optical incremental encoder has overall of 3600 numbers of transparent and opaque slots. Calculate the angular resolution of the encoder in degree.

7. Write the rotation matrix about x-axis.

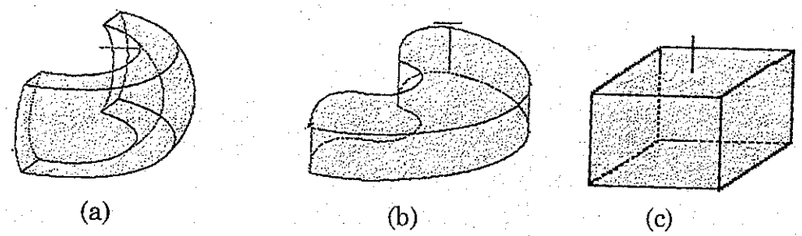
8. What is manipulator Jacobian ?

9. How do we calculate payback period in robotics ?

10. What is AGV ?

PART – B (5×13=65 Marks)

11. a) Identify the appropriate robots for the given work volume in figure 1 and sketch the 3 dimensional configurations with joint description in detail. (13)



(a) (b) (c)

Fig. 1

(OR)

b) i) Describe the anatomy of SCARA manipulator. (8)

ii) Show the various joints used in industrial serial manipulator. (5)

12. a) Elaborate the various types of mechanical gripper in detail. (13)

(OR)

b) Discuss the construction, electrical equivalent circuit and working of VR stepper motor. (13)

13. a) Design a vision system and brief the stages of machine vision in detail with neat illustration. (13)

(OR)

b) Write short notes on following sensors with neat illustration ;

i) Position sensors. (3)

ii) Laser range finder. (3)

iii) LVDT. (7)

14. a) Explain the following :

i) Trajectory Generator. (7)

ii) Manipulator dynamics. (6)

(OR)

b) Develop a program in VAL to command a robot to unload a cylindrical part of 10 mm diameter from machine 1 positioned at point P1 and load the part on machine 2 positioned at P2. The speed of robot motion is 40 inch/sec. however due to safety precautions, the speed is reduced to 10 inch/sec. while moving to a machine for an unloading or loading operation. (13)

15. a) Design a layout using single robot at the centre for serving two turning centre. Robot has to access two turning centre and conveyor for loading and unloading and material transfer. (13)

(OR)

b) Discuss safety considerations for robot operations. (13)

PART – C (1×15=15 Marks).

16. a) Explain the different applications of robots.

(OR)

b) Discuss Economic analysis of robots.