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**Question Paper Code : 71484**

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2015.

Sixth Semester

Electrical and Electronics Engineering

EE 2023/EE 603/10133 EEE 14 — ROBOTICS AND AUTOMATION

(Common to Eighth Semester Electronics and Instrumentation  
Engineering/Instrumentation and Control Engineering)

(Regulation 2008/2010)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State Asimov's laws of robotics.
2. What is the need of dynamic stabilization in robot?
3. State the difference between tactile and touch sensor.
4. Gear 1 (driver) is turning at speed  $S_1$  rpm and has  $T_1$  teeth. Gear 2 (driven gear) is turning at speed  $S_2$  and has  $T_2$  teeth. What is the gear ratio relationship between gear 1 and gear 2?
5. What are the applications of parallel manipulator?
6. List the advantages and features of suction cup gripper.
7. What is homogenous transformation of coordinates?
8. List the advantages and limitations of off-line programming.
9. What is meant by palletizing and depalletizing?
10. List any four manufacturing applications of robot.

PART B — (5 × 16 = 80 marks)

11. (a) Discuss with figures the features, advantages, limitations and applications of different Robot configuration. (16)

Or

- (b) (i) What do you mean by degree of freedom? How many degree of freedom is required to position and orient end effectors in 2-dimensional space? (8)
- (ii) Explain the typical configuration and degree of freedom for wrist assembly. (8)

12. (a) Write short notes on :

- (i) Thresholding (5)
- (ii) Region growing (5)
- (iii) Edge detecting (6)

Or

- (b) Discuss response, range, accuracy and sensitivity in relation to robot sensors. Explain the working principle of proximity sensor. (16)

13. (a) What is an actuator? What are the different types of actuators used for robots? Explain the working of a hydraulic actuator system. (16)

Or

- (b) Describe with neat sketches the features, merits, limitations and applications of following grippers :
- (i) Magnetic gripper (8)
- (ii) Vacuum gripper (8)

14. (a) A 2D two link robot has length  $L_1 = 5$  cm and  $L_2 = 4$  cm and end effectors position at  $[X_p, Y_p]$  is (3.5, 7.5). Find joint angle between link 1 and the ground surface. (16)

Or

- (b) Illustrate with neat sketch and derive Forward and Inverse Kinematics mechanism for 2 Dimensional 3 Joint Robot. (16)

15. (a) What is the need of robots and automation in following applications?

- (i) Welding (5)
- (ii) Die Casting (5)
- (iii) Palletizing (6)

Or

(b) Write short notes :

- (i) Robot cell layouts. (8)
- (ii) Selection of a robot. (8)