Register Number:……..

B.E., DEGREE EXAMINATIONS: APRIL/MAY 2014

(Regulation 2009)

Seventh Semester

MECHATRONICS ENGINEERING

MCT118: Robotics and Machine Vision System

Time: Three Hours **Maximum Marks: 100**

Answer ALL Questions:-

PART A (10x1=10 Marks)

1. The individual joint motions associated with arm, body and wrist motions are referred by the term
   a) Degree of Freedom b) Transformation c) Orientation d) Position 2.
2. The Notation scheme used to designate Polar configuration system
   a) RVL b) TRL c) LVL d) TLR
3. The technique used for modeling and analysis is
   a) Image processing b) Data reduction c) D-H Representation d) Matrix
4. If the link length and joint angles are known, then the position and orientation of hand of robot is calculated by
   a) Kinematic analysis b) Inverse Kinematics
   c) Direct kinematic analysis d) Both b) & c)
5. The device used to separate the part from magnetic Gripper is
   a) Stripper b) Collar c) Part remover d) Angle
6. The sensor used to detect smoke is
   a) Tactile sensor b) Sniff sensor c) Touch sensor d) Range sensor
7. Example for diffuse surface illuminators are
   a) Incandescent lamps b) CFL c) Fluorescent lamps d) Focus Lamps
8. The distribution of different grey levels are determined by
   a) Photosite b) windowing c) CID camera d) Histogram
9. The following is one of the Grey morphology operation
   a) Dilation b) Boolean c) Image segmentation d) Encoding

10. The technique used for depth measurement is
    a) Skeletonization b) Stereo imaging c) Object recognition d) Image sizing

PART B (10 x 2 = 20Marks)

11. What are three laws of robotics by Asimov?
12. Define work space? What are the factors that influence work space?
13. Express the vector P = 3i+5j+2k into matrix form, if it were to describe a direction as unit vector.
14. What are the common configurations for orientation in direct and reverse kinematics?
15. What are the factors considered in selection and design of gripper?
16. What is triangulation? Mention its significance.
17. What are the techniques available for range and depth analysis?
18. Define *Threshold* relates to digital image.
19. What is image processing? Mention its significance.
20. What are the techniques involved in image processing and analysis?

(PART C (5x14=70Marks)

21. a) (i) What are the four types of Robot Controls? Explain. (10)
    (ii) What are the Characteristics to specify a robot? (4)

(OR)

b) (i) Explain *Stability* and *Speed of Response*. (4)
(ii) Discuss in detail, the precision of movement related to robot performance. (10)

22. a) (i) A point $P(7,3,2)^T$ is attached to frame (n, o, a) and is subjected to transformations as
    (1) Rotation of 90° about z-axis.
    (2) Followed by Rotation 90° about y -axis
    (3) Followed by translation of (4,-3,7) (10)
    (ii) Explain degeneracy and Dexterity. (4)

(OR)

b) Explain in detail, the forward and reverse kinematics Equations for position.

23. a) What are the types of Gripper mechanisms? Explain any four in detail

(OR)

b) (i) Discuss in detail , the Touch and Tactile sensor with neat sketch. (6)

(ii) What is Encoder? What are the types of Encoders? Explain in detail with Sketch. (8)

24. a) Explain the working of Vidicon Camera with neat sketch.

(OR)

b) (i) Write short notes on i) Sampling ii) Quantization (6)

(ii) Explain the principle of Image acquisition with digital camera. (8)

25. a) What are the binary morphology operations? Explain in detail.

(OR)

b) What is image analysis? Explain *Object recognition* and *Feature extraction* in detail.

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