ME38 WMR

Wheeled Mobile Robots

Assignment 1

1. What is the traditional 3Ds of Robotics?
   - ◯ Design, Detail and Delicate
   - ◯ Dull, Dirty and Dangerous
   - ◯ Dull, Discipline and Domestic
   - ◯ Dear, Dimension and Dangerous
   - ◯ Domestic, Domain and Deal
   - ◯ Dirty, Deep and Domestic

   Correct answer is **Dull, Dirty and Dangerous**

2. _____ is the effect on the environment of an effector causes motion of the effector itself.
   - ◯ Manipulation
   - ◯ Locomotion
   - ◯ Multiplication
   - ◯ Accumulation
   - ◯ Complex motion
   - ◯ Slew motion

   Correct answer is **Locomotion**

3. The role of the controller is to get the effectors to _____ the desired effect on the environment, based on the robot's task. Correct answer is **produce**

4. If the effect on the environment causes motion of the objects around is called manipulation.
   - ◯ True
   - ◯ False

   Correct answer is **True**

5. Theoretically conventional wheels can move in _____
   - ◯ only lateral direction
   - ◯ only longitudinal direction
   - ◯ both lateral and longitudinal directions
   - ◯ No specific directions
   - ◯ only vertical direction
   - ◯ all three directions

   Correct answer is **only longitudinal direction**

6. What is minimum number of contact points required to make the system stable?
   - ◯ 1
   - ◯ 2
   - ◯ 3
   - ◯ 4
   - ◯ 5
   - ◯ 6

   Correct answer is **3**

7. Degree of freedom of a motion system is the _____ number of variables to describe the system.
Correct answer is **minimum**

8. For the land-based wheeled mobile robots and water surface vehicles: the degree of freedom is _____

   ◯ 1
   ◯ 2
   ◯ 3
   ◯ 4
   ◯ 5
   ◯ 6

   Correct answer is **3**

9. Degree of maneuverability is _____

   ◯ equal to degree of freedom
   ◯ equal to degree of mobility
   ◯ equal to degree of steerability
   ◯ sum of degree of mobility and degree of freedom
   ◯ sum of degree of freedom and degree of steerability
   ◯ sum of degree of mobility and degree of steerability

   Correct answer is **sum of degree of mobility and degree of steerability**

10. Legged locomotion requires lower or lesser degrees of freedom and therefore greater mechanical complexity than wheeled locomotion.

    ◯ False
    ◯ true

    Correct answer is **False**

11. For given velocity input commands, finding the derivatives of generalized coordinates (finding the system's motion) is known as inverse differential kinematics.

    ◯ False
    ◯ true

    Correct answer is **False**

12. The vector of the input velocity command of the land-based mobile robot is given as $\boldsymbol{\zeta} = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$ and the mobile robot (body) frame is oriented 90° with respect to the fixed frame. In this case, what will be the time derivatives of the generalized coordinates?

    ◯ $\dot{\boldsymbol{\eta}} = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$
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◯ $\dot{\boldsymbol{\eta}} = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$

Correct answer is $\dot{\boldsymbol{\eta}} = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$

13. For a conventional car or a van (considering only ground/land based): the degree of freedom is _____ and the degree of maneuverability is _____

    ◯ 2 and 3
    ◯ 2 and 2
    ◯ 3 and 2
    ◯ 3 and 3
    ◯ 3 and 4
    ◯ 2 and 4

    Correct answer is **3 and 2**

14. For a four mecanum wheel drive mobile robot: the degree of mobility is _____ and the degree of steerability is _____

    ◯ 4 and 4
    ◯ 0 and 4
    ◯ 4 and 0
    ◯ 3 and 4
    ◯ 4 and 3
    ◯ 3 and 1

    Correct answer is **4 and 0**

15. For a three omni wheel drive mobile robot: the degree of mobility is _____ and the degree of steerability is _____

    ◯ 3 and 3
    ◯ 0 and 3
    ◯ 3 and 0
    ◯ 3 and 6
    ◯ 2 and 1
    ◯ 1 and 2

    Correct answer is **3 and 0**