

**e-Yantra Robotics Competition - 2018**

**Theme and Implementation Analysis – Ant Bot**

**<Team ID>**

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| --- | --- |
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| **Date** |  |

**Scope and Preparing the Arena**

**Q1. a. State the scope of the theme assigned to you.**

**(5)**

< Team should briefly explain in their own words the theme assigned. What in your opinion is the purpose of such an application?

Answer format: Text, Word - limit: 100 words>

**b. Upload the Final Arena Images.**

**(20)**

< Prepare the arena according to the steps given in Section 4: Arena, of the Rulebook. Please follow the sample SIM Placement Document (provided in Task 2) and example Supply Placement Table and Trash Placement Table in section 3: Theme Description of arena. Your final arena should look like as shown in Figure 7 of Rulebook.

**Take 4 photos** of the completed arena from different angles such that the entire arena along with its components such as SIMs, Supply Blocks, Trash Blocks, AH Walls, etc., are clearly visible in the photos.

Answer Format: The four image files should be uploaded as **.jpg** along with this document as per instructions in Read Me for Task 3. >

**Building Modules**

**Q2. Identify the major components required for designing the robotic system for the theme assigned to you.**

**(5)**

< Team should classify the components into various categories: mechanical systems, electronic systems etc. and mention how these units will be used in the theme. You may draw diagrams/figures to illustrate your answer.

Answer format: Bulleted form

1. Component 1

2. Component 2

3. Component ….etc. >

**Power Management**

**Q3. a. Explain the power management system required for a robot in general and for the theme assigned to you in particular.**

**(5)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sl. No.** | **Component** | **Max. Current drawn** | **Voltage rating** | **Quantity** | **Max. Power rating** | **Remarks** |
| 1 | Raspberry Pi (Model 3 B+) | 1.2 A | 5 V | 1 | 6 W | Maximum total USB peripheral current draw |
| 2 | Arduino Nano | 0.2 A | 5 V | 1 | 1 W | IO pins giving 200 mA each |
| 3 | 12V 100 RPM DC Motor | 1.0 A | 12 V | 2 | 24 W | Considering with Robot’s load |
| 4 | Standard Servo  GS-5515 MG | ^0.2 A  \*2.0 A | 5 V | 1 | ^ 1 W  \*10 W | - Current considered at idle (^) and running (\*)  - No Load |
| 5 | Micro Servo | ^10 mA  \*200 mA | 5 V | 1 | ^ 50 mW  \*200 mW |
| 6 | Buzzer | 10 mA | 5 V | 1 | 50 mW |  |
| 7 | Line Sensor | 16 mA | 3.3 V | 1 | 53 mW |  |
| 8 |  |  |  |  |  |  |

From the table above, we will infer that maximum current of 5.6 A, (a maximum power of 41 W) may be drawn at a point of time.

Current drawn when the robot is idle is less than 2 A.

Hence to run the robot continuously for 30 minutes, we would need a battery of approximately 2 Ah capacity.

**b. Can there be a single power supply for your robot? - Yes/No/Don’t know. Please elaborate/justify your answer choice.**

**(5)**

**Design Analysis**

**Q4.** **Team have to design a robot which traverses the arena following a given path.**

**a. How will you design a robot to traverse the arena given in the rulebook?**

**(5)**

    < Explain your path planning technique(s). Clearly specifying the hardware components, inputs and outputs for your technique. You can explain multiple techniques.

Word-limit: 500 words. >

**b. How many actuators do you feel are sufficient for designing a pick and place mechanism? If you are going to use additional actuators (apart from those provided in the kit), how and for what purpose do you plan to use them?**

**(5)**

< Justify your answer by stating the advantage(s) of the chosen actuator(s) over others.

Answer format: Text, Word - limit: 200 words>

**Environment Sensing**

**Q5. a. Explain how you will use the Line Sensor to decide the course of traversal (identifying line and nodes).**

**(5)**

< Team should explain in detail how they will use the Line Sensor to traverse between two points/nodes in the arena.

Answer format: Text, Word - limit: 300 words>

**b. Would the webcam be a better choice of camera over the PiCam? Explain.**

**(5)**

< Think which a better option is: using a webcam or Picam? Support your answer by listing pros and cons of choosing each option.

Answer format: Text, Word - limit: 200 words >

**c. What other sensors will the robot require to complete its task successfully?**

**(5)**

< Answer format: Bulleted form

1. Sensor 1

2. Sensor 2

3. Sensor 3 ….etc. >

**d. Explain the strategy you will follow to detect and indicate the SIM placed around the Central Node (This includes traversing strategy to reach different SIMs).**

**(4)**

< Answer format: Bulleted form

1. Step 1

2. Step 2

3. Step 3 ….etc. >

**Testing your Understanding (Theme Analysis and Rulebook-related)**

**Q6. a. If at a given SIM location ArUco ID is found to be 76 (Decimal), what is the Ant Hill Number and type (Regular Ant Hill or Queen Ant Hill) and what are the Service Requirements of this Ant Hill?**

**(3)**

< Explain in your own words. Answer format: Bulleted form, word-limit: 30 words

Ant Hill Number:

Ant Hill type:

Service Requirements:

>

**b. Is SIM0: 25, SIM1: 60, SIM2: 217, SIM3: 226, a possible combination of SIMs to be placed on the arena? If not explain with reasons.**

**(3)**

< Explain in your own words. Answer format: Bulleted form, word-limit: 300 words

Reason 1:

Reason 2:

Reason 3:…etc. >

**c. What are the different conditions that indicate end of a run?**

**(3)**

< Explain in your own words. Answer format: Bulleted form, word-limit: 300 words

Condition 1:

Condition 2:

Condition 3:…etc. >

**Algorithm Analysis**

**Q7. Draw a flowchart illustrating the algorithm you propose to use for theme implementation.      (10)**

< The flowchart should elaborate on every possible function that you will be using for completing

all the tasks in the assigned theme. Follow the standard pictorial representation used to draw a

flowchart.

Answer format: Text, Word-limit: 1000 words >

**Q8. Suppose for a given arena configuration, it takes 20 seconds more to execute the task while keeping the Queen Ant Hill in priority. What will be your logic to traverse the arena in order to secure maximum marks i.e. you will serve Queen Ant Hill first by taking 20 seconds more or complete the run faster by not serving Queen Ant Hill first (Assuming, points scored for all other parameters in Total Score in both the cases remain same). Please explain and justify your logic and strategy.**

**(4)**

< Answer format: Text, Word-limit: 450 words >

**Challenges**

**Q9. What are the major challenges that you can anticipate in addressing this theme and how do you propose to tackle them?**

**(8)**

< Answer format: Bulleted form

1. Challenge 1

2. Challenge 2

3. Challenge 3, etc. >