



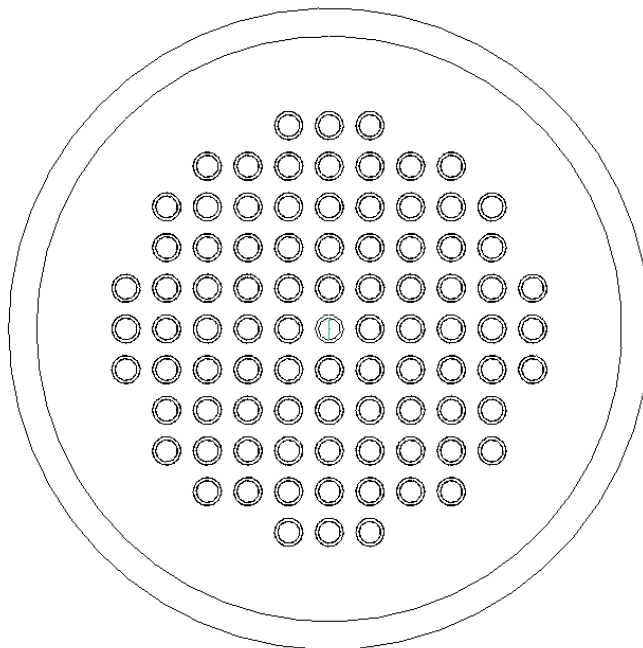
## Recruitment Quiz – Sample

### Instructions:

- You are required to solve the problems stated in this document and email your response to [careers@alcyon.co.in](mailto:careers@alcyon.co.in).
- You are strongly discouraged from taking any external help in solving these problems. The final interview might include a similar problem-solving session.
- These problems are formulated to test your design fundamentals, and should not require the use of any design software. However, you are encouraged to use any software tools that you feel will aid you.
- We believe that all required data has been provided to solve the problems. If you believe this in error, please make the necessary assumptions and proceed with your solution. We will not respond to any emails asking for problem clarifications.
- You will also be evaluated on the presentation of your response. We require that all our employees have excellent communication skills, and written skills and email etiquette are of importance.

### Problems:

1. A lit candle of height  $h$  is placed at the center of a circular plate. The plate is fixed to a wall at a height  $H$ , such that it just touches the wall and the width of the plate's shadow at the foot of the wall is  $w$ . Derive an equation for the maximum width of the plate's shadow on the floor, using the given variables.
2. The diagram shown in the figure below is the top view of a hollow hemisphere of thickness 7mm and internal radius of 72mm, with an array of vertical tubes (7mm OD, 1mm thick) on its inner surface. The maximum height of all tubes from the inside surface of the hemisphere is the same and is equal to 10mm. The horizontal pitch of the tubes is 10 mm. Write an algorithm, or devise a methodology to generate the pattern.





## Recruitment Quiz – Sample

3. A cuboid box with length “**L**”, width “**W**”, and height “**H**”, is initially lying with one corner (corner A) at the Origin (0, 0, 0), The length of the box is along positive X axis, its width is along positive Y axis, and its height is along positive Z axis. Corner B is the corner defining the other end of a body diagonal drawn through corner A.
- The box is translated through a distance **x** along the X-axis, **y** along the Y-axis, and **z** along the Z-axis.
  - The box is then rotated about a line parallel to the X-axis and passing through A, through an angle  **$\alpha$**  (alpha).
  - It is then rotated about a line parallel to the Y-axis and passing through A, through an angle  **$\beta$**  (beta).
  - The final rotation is about a line parallel to the Z-axis and passing through A, through an angle  **$\gamma$**  (gamma).

(The rotation angles are measured positive along the respective positive axis according to the right hand rule)

At the final resting position of the box, give the co-ordinates of corner B in terms of the above data.