RSC Inductions 2021-2022

Instructions: -

1. Explanation is must for all answers.

2. Attempt maximum questions possible.

3. No extra time will be granted for submissions.

4. Assume suitable data wherever necessary and mention them in your answers. Don't assume any data/value without mentioning it.

5. Few of the questions may be open ended and there is no accurate response to them. Your answers will be evaluated in accordance with the justification you'll provide and your approach.

6. **Originality and innovation in your answers will add points.**

7. Even if you are unable to get to the final answer, each step or your logic will fetch marks, so don't forget to mention it.

8. Scan and send handwritten answers with these details clearly mentioned on the first page: **Name, MIS, College email ID, Contact number**.

9. Submit the paper on :
https://docs.google.com/forms/d/e/1FAIpQLSfixGxxEPOY8qJt8fy1bKAi5L08LpF6-IBykECj-HhZzYjtLA/formResponse
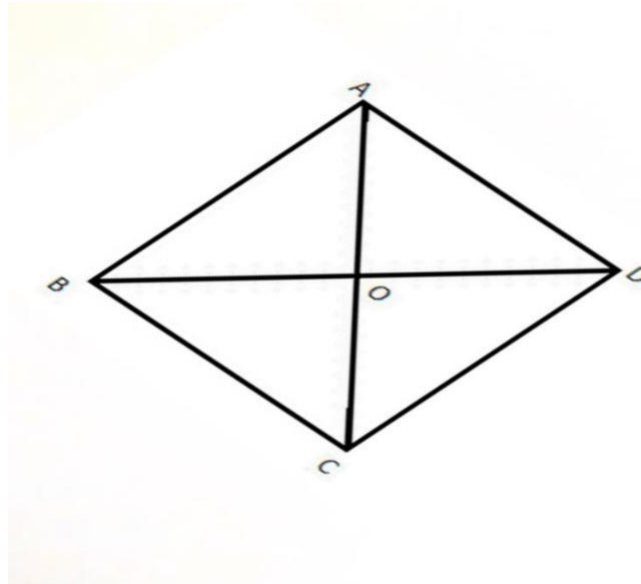
(open the link using Google Chrome)

(Submission Date: 18 October 2021, 7:30 pm)

Contact in case of queries: -
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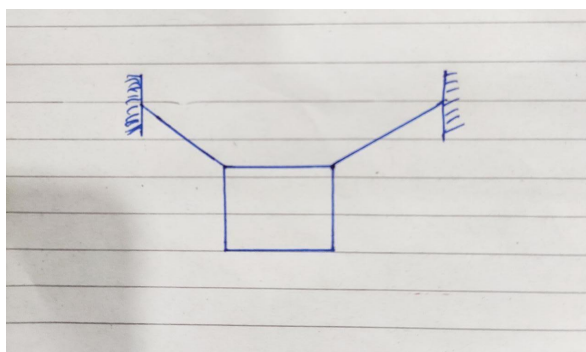EXPLORE.LEARN.BUILD.SHARE
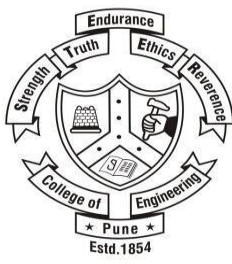
M- Paper:

1. Draw the isometric view of the body having the same front view and top view as follows.

2. Draw a free body diagram of the block resting on the horizontal surface, show push force/pull force vectors with friction vector, which force direction will be more efficient to move the block and why?

3. Block suspended in air by 2 strings, find the condition for keeping the string perfectly horizontal.

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4. At t = 0 a batter hits a baseball with an initial speed of 40m/s at a 53-degree angle to the horizontal. An outfielder is 70 m from the batter at t = 0, and, as seen from home plate, the line of sight to the outfielder makes a horizontal angle of 20 degrees with the plane in which the ball moves. What speed and direction must the fielder take in order to catch the ball at the same height from which it was struck? Give angle with respect to the outfielder's line of sight to home plate. Will the outfielder ever be able to catch the ball? comment.

5. A ball of mass 'k' is placed on a spring with spring constant 'M'. The spring is making an angle 'x' with respect to the ground length of the spring is 'S'. When the spring with the ball is compressed and then released, the ball follows projectile motion. Derive the equations of motion. Also establish a relationship of velocity, range and height with spring constant and spring compression respectively.

6. A link is fixed at one end and carries a symmetric body at other end, such that the body 0is thrown by rotating link through a certain angle theta. Considering that after being thrown the body follows a parabolic path. Analyze the motion, what forces do you feel must be considered, explain the motion in your word

7. (A)A hollow sphere is half submerged in liquid of specific gravity 0.75. The outer radius of the sphere is 12cm. Density of the sphere is 1.5x10^3 kg/m^3.

To find-

 i. Inner radius and thickness of sphere.

 ii. Draw its orthographic views including a sectional view.

 iii. Determine the mass of the sphere

 iv. Determine its upthrust.

(B) The hollow sphere is then attached to the bottom of the tank with the help of strings (as shown in diagram), Where T2=2T3.

- Calculate tension in each string.
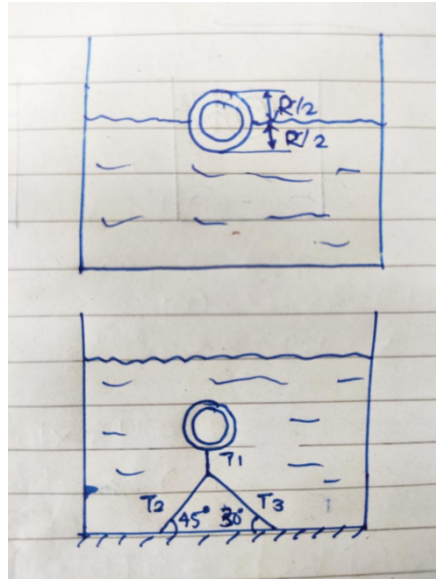
8. Refer to the video link attached: https://youtu.be/3kX24bf7Xlg.

A simple diagram of the setup seen in the video is as shown. If a = 5mm, b = 15mm and c = 300mm,
find:

    a) The amount of force at i, ii, iii, iv & v along the sticks in terms of force exerted by mass M.

    b) If 200N is the maximum force applied at any point on the stick that could be withstood by the stick, what is the maximum load that could be held by this setup and which stick would break first?
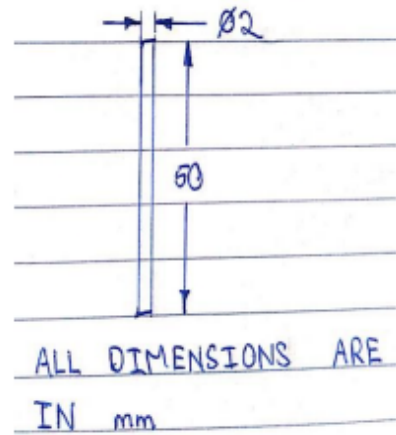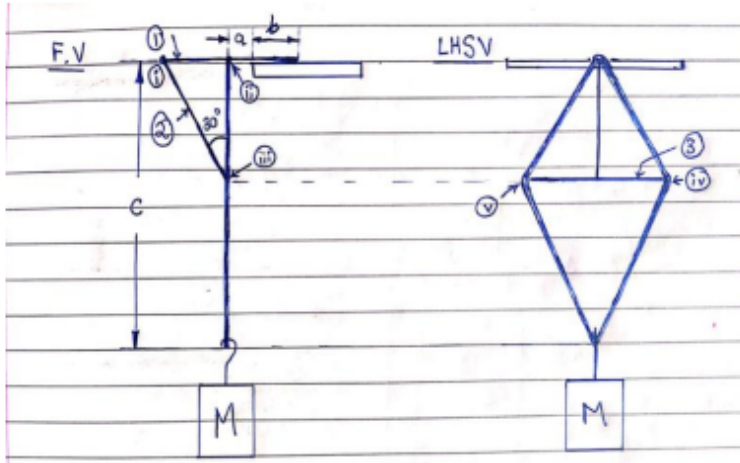
9. Find the value of D i.e. distance between pole A and pole B.
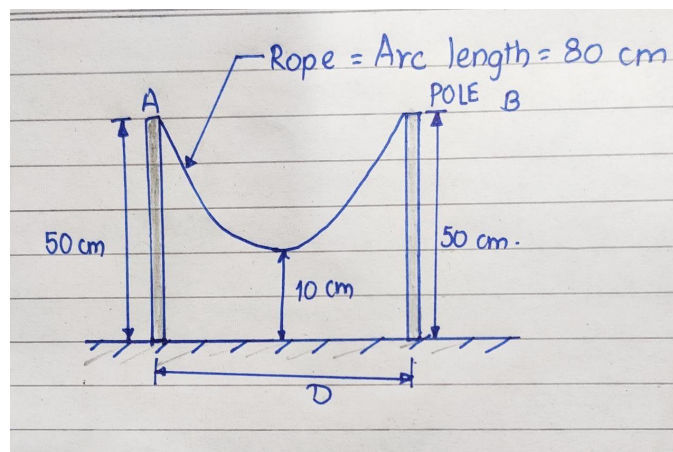
10. There's a game called "Red light, Green light". Where a doll turns her head 180 degrees apart in 2 seconds. The distance between start and the end of the playground is 100 meters, where the doll is placed across the finish line. The doll sings the song for 10 seconds, and the duration of the round is 5 minutes. If any player won't be able to complete the 100 meters track, the player is eliminated. After the doll stops singing, she turns her head 180 degrees and faces the players, after which the red light shows up, apart from that, the rest of the time green light is displayed, where people can move ahead towards the finish line. She has sensors in her eyes that can detect the motion of people. If the motion of players is detected while the red light is displayed, that player gets eliminated.
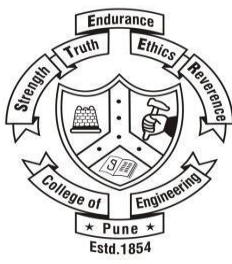
Calculate:

i) The minimum time required for a player to traverse through the 100 meters track.

ii) Plot the speed v/s time graph for the player, for one period.

(Maximum speed and acceleration of player are 1.66 m/s and 2 m/s^2 respectively)

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BEST OF LUCK