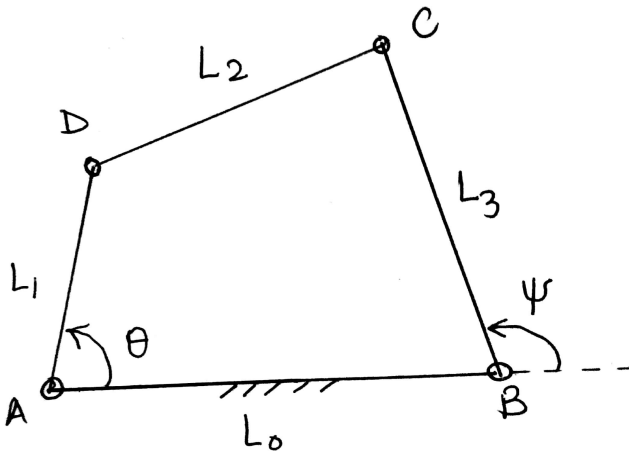
Handout for ME352A Computer Based Quiz

ME Department, IIT Kanpur, Duration: 75 min, Marks: 40

Prepared: November 13, 2017

Instructions: You can send ONE page to the printer. Word or pdf. Your name and roll number should be on that page. All your printed output must fit within that page. You can later write on your printout by hand, and attach other handwritten sheets. The following questions, together with the handout I sent earlier, indicate the level of difficulty you can expect. The actual questions may be changed slightly, and/or another small question may be added. You can save space by using the subplot command in Matlab. Also by saving your plots in jpeg or tiff format and then inserting them into a Word document.



1. For a four bar mechanism (see above), $L_0 = 5.9$ m, $L_1 = 3$ m, $L_2 = 4$ m and $L_3 = 4.5$ m. When $\theta = 50°$, $\psi \approx 97°$. For θ from $40°$ to $90°$, compute ψ and plot a graph of ψ versus θ. Distinguish between degrees and radians, or your answers may be incorrect.

2. In a cam-follower mechanism with a flat-face follower, the follower movement (in mm) is

$$y(\theta) = \frac{170 \sin^6\left(\frac{\theta}{2}\right)}{1 + 6\sin^6\left(\frac{\theta}{2}\right)}.$$

   The cam profile radius ρ is required to be more than 60 mm everywhere. Numerically plot $y(\theta) + y''(\theta)$ and thereby determine the minimum base circle radius r_b.

Hints: If I want to plot

$$y(\theta) = \frac{\sin^2\theta}{1 + \sin^2\theta}$$

then I use the following in Matlab.

```
theta=linspace(0,2*pi,300);
y=(sin(theta).^2)./(1+sin(theta).^2);
plot(theta,y)
```

The Matlab commands `subplot(1,2,1)` and `subplot(1,2,2)`, for example, help me arrange my plots in a sometimes-useful way. Also try the command `print -djpeg -r200 ff.jpg` for saving a plot in jpeg format.