

CSE4421Z Midterm test  
Wednesday, March 6, 2013  
2:30 PM–3:20 PM

This is a closed book test. No aids are permitted except for a non-electronic dictionary. Answer the questions in the spaces provided on the question sheets.  
You may use the back of the pages if you need more space for your answers.

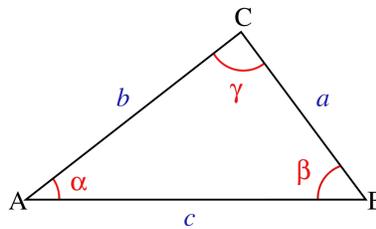
Name and student number: \_\_\_\_\_

1. / 10
2. / 15
3. / 25

Possibly useful information:

Law of cosines:

$$c^2 = a^2 + b^2 - 2ab \cos \gamma$$



Denavit-Hartenberg transformation:

$$T_i^{i-1} = R_z(\theta_i)T_z(d_i)T_x(a_i)R_x(\alpha_i)$$

Denavit-Hartenberg parameters:

$a_i$ : distance between  $z_{i-1}$  and  $z_i$  measured along  $x_i$

$\alpha_i$ : angle from  $z_{i-1}$  to  $z_i$  measured about  $x_i$

$d_i$ : distance between  $o_{i-1}$  to the intersection of  $x_i$  and  $z_{i-1}$  measured along  $z_{i-1}$

$\theta_i$ : angle from  $x_{i-1}$  to  $x_i$  measured about  $z_{i-1}$