

Name: \_\_\_\_\_ Matric #: \_\_\_\_\_

You do not need to simplify nor numerically evaluate the expressions for your answers:

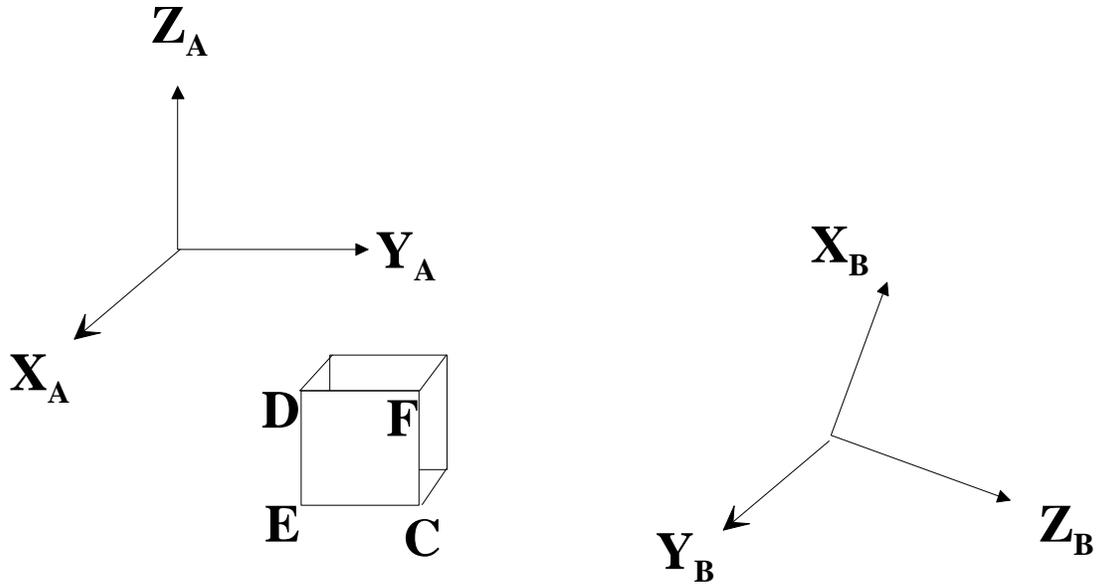
1. Two Frames A & B are initially coincident. Frame A is fixed, while Frame B moves according to the following sequence:
  - i) Rotation about  $X_A$  of 30 degrees
  - ii) Rotation about  $Y_B$  of 60 degrees
  - iii) Rotation about  $Z_A$  of 90 degrees, and
  - iv) Translation of (1,2,3) along Frame B.

Find the new position and orientation of Frame B in Frame A. (Express this as a homogeneous transformation matrix.)

Ans:

(please turn over)

2. In the figure below, the origin of frame B is at  $(5, 10, -3)$  with respect to Frame A, and the corner C of the cube is at  $(6, 7, 1)$  with respect to Frame A. The cube has a side of dimension 1 unit. The DECF face the cube, yz plane of Frame A and xz plane of Frame B are all parallel. The cube is rotated by 30 degrees about  $Y_B$ . Find the new coordinates of E in Frame A after this rotation.



Ans: