



**Question 4 – (15 marks)**

Using the Table below, determine the reducible representation for the planar *trans*-N<sub>2</sub>F<sub>2</sub> molecule. Using the appropriate character table, factor the reducible representation into a set of irreducible representations and subsequently into a set of irreducible representations corresponding to the *vibrational modes only*. Give the labels of the IR and Raman active modes.

<u>Symmetry Operation</u>	<u>Character Contribution per Unshifted Atom</u>
E	3
i	-3
σ	1
C <sub>2</sub>	-1
C <sub>3</sub>	0
C <sub>4</sub>	1
C <sub>6</sub>	2
S <sub>3</sub>	-2
S <sub>4</sub>	-1
S <sub>6</sub>	0

**Question 5 – (10 marks)**

Consider the *octahedral* complex [VBr(SCN)(en)<sub>2</sub>]Br (en = ethylenediamine)

Give one example (draw two structures) of each of the following forms of isomers: a) geometric b) optical c) linkage d) ionization e) name the two structures you drew in part d).