VII. CONCLUSIONS

Effects of rotation on the intermediate band indices uvby and H$_S$ are firmly established empirically from published data for many clusters. The observed positions of single main-sequence stars and single-lined spectroscopic binaries in a given plane defined by any two of the indices were used to establish the relative displacements due to rotation.

As interstellar extinction also reddens the stars, the Alpha Persei Cluster was analysed using both observed and dereddened indices. It was found that for Alpha Persei, where non-uniformity of extinction is not large, both reddened and dereddened indices lead to similar results. However, as suggested by Gray and Garrison, we used the observed indices for other clusters as dereddening procedures for A-stars are based on an assumed calibration which may be in error due to rotational reddening.

Evolutionary effects will introduce a scatter if the cluster members are not coeval. This is evident from our results for the Scorpio-Centaurus association. Here the upper Scorpius members which are younger than the Lower Centaurus and Upper Centaurus subgroups were found to be separated in all diagrams of colour excess due to reddening versus v sin i diagrams. Also the scatter for upper Scorpius was large where the interstellar extinction was highly non-uniform. The upper Centaurus and lower Centaurus group which are unreddened, consisting mostly of B2 and B3 type-stars show the reddening effect due to rotation in perfect agreement with theoretical predictions by Collins & Sonneborn (1977) for stars in the similar mass range.

As the predicted effects are a function of the mass, we analysed all clusters grouping them into three mass ranges corresponding to the spectral type ranges B0-B3, B5-B9 and A3-F0. The predicted indices for these ranges by Collins and Sonneborn were analysed the same way as we did our observational data.

In our analysis of the theoretically derived indices we did not assume any distribution in V or i. Instead, for each value of i (30°, 45°, 60° and 90°) we took sixteen values corresponding to $\omega$=0.2, 0.5, 0.8 and 0.9 for the mass range corresponding to the spectral types from B0-B3, B5-B9 and A3-F0 and derived the rotation effects in different planes (such as $\beta$, $c_1$, $\beta$,(u-b) etc.). We found that the rotation effects determined from observed data points for clusters, very closely matched the predictions for the various mass ranges. We have established very firmly that not only rotation effects can be discerned from observations but also that the agreement is excellent with theoretical predictions of Collins & Sonneborn.
(1977) for rigidly rotating stars.

The observed rotation effects, together with theoretical predictions were used to derive ZRMS for various clusters. The sequences were combined to derive a preliminary ZAZRMS values of the various indices.

The most dramatic result that we have obtained is that the blue straggler phenomenon in young galactic clusters can be completely interpreted in terms of rotation effects in colour magnitude diagrams; at least in the large majority of clusters with ages less than or equal to Hyades.

These results also raise some basic questions, such as the possible errors in estimates of ages of galactic clusters. Rotation affects the various indices differently and all indices do not show peak effects at the same spectral type. They would introduce great errors in age estimates, much greater than those calculated by Maeder (1970). This and other questions such as the errors in distance modulus estimated purely from photometry etc have to be considered in future work on this subject.