

**PHD QUALIFY EXAMINATION —
GALACTIC AND EXTRAGALACTIC ASTROPHYSICS**

8th October, 1996

(1) (25 points)

Fundamental classification of galaxies, such as Hubble Classification, is based on their morphology. However, other physical characteristics, quite unrelated to the original classification criteria, are now proven to have systematic changes along the morphological classification sequence. This proves the value of such classification in our quest to understand galaxies.

- (a) Describe the details of Hubble classification including the original definition of each sequence.
- (b) Discuss their characteristic surface brightness and color distribution, stellar/gas/dust contents.

(2) (25 points)

Consider a group of stars gravitationally bound together. Its mass is m and radius is r .

- (a) Assume that the system rotates rapidly (but not at relativistic velocity). At what rotational velocity will it break up. Assume the body remains spherical until breakup.
- (b) Suppose that this system is approaching a massive object (say, galaxy center) of mass M . At what distance, does the tidal disruption occur?
- (c) Assume that this system is in circular orbit around a massive object of mass M . At what distance, does the tidal disruption occur?

In (b) and (c), ignore the internal motion (such as rotation) within the given system of stars.