PART IV

Attempt **TWO** *questions in this Part, which carries 24% of the marks for the examination. All of these questions carry equal marks. You are advised to spend about* **40 minutes** *on this Part. Write your answers to this part in the SEPARATE ANSWER BOOK provided.*

Remember to write your name, personal identifier and examination number on your answer book.

Question 7

Compare the halo and the bulge of our Galaxy (or of another typical spiral galaxy) by listing the features that are common to both, and the distinguishing features.

Question 8
part a, 1.5%
part b, 2.5%
part c, 6.5%
part d, 1.5%

Note: Throughout this question you may assume that the material moves in circular orbits and that $M(r) = rv^2/G$, where $M(r)$ is the mass inside a radius r.

(*a*) What measurements are made to obtain the rotation curve for a galaxy?

(*b*) Figure 2 shows the rotation curve for a hypothetical spiral galaxy.

(i) Explain what is meant by differential rotation.

(ii) Is there differential rotation:

- at radii less than r_1?
- at radii between r_1 and r_2?
- at radii greater than r_2?

(*c*) Using the rotation curve describe as fully as you can how the material in this galaxy is distributed and how it is moving:

(i) at radii less than r_1

(ii) at radii between r_1 and r_2

(iii) at radii greater than r_2.

(*d*) How might the total mass of the galaxy be estimated?

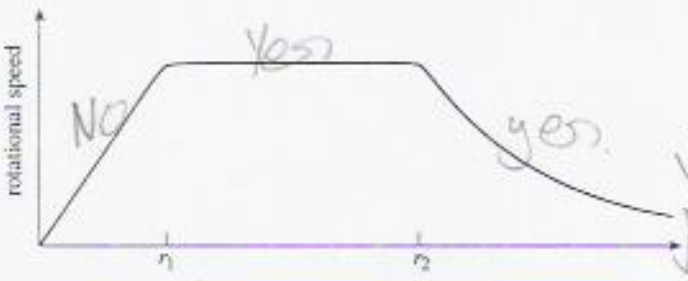

Figure 2 The rotation curve for a hypothetical spiral galaxy.