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Any Calculator

UNIVERSITY OF BIRMINGHAM

School of Physics and Astronomy

DEGREE OF BSc & MSci WITH HONOURS

FIRST YEAR EXAMINATION

03 20521

INTRODUCTION TO ASTROPHYSICS

The total time allowed is 1 hour

SUMMER 2007

*Students should answer two questions.
If more than two questions are attempted only the first two attempted
questions will be marked.*

*Calculators may be used in this examination but must not be used to store
text.*

*Calculators with the ability to store text should have their memories deleted
prior to the start of the examination.*

*Two tables of physical constants and units that may be required will be found
at the end of this question paper.*

TURN OVER

***Students must answer two questions out of three.
If you answer more than two questions, only the first two will be marked.***

1. (a) Explain how Cepheid variable stars can be used to determine the distances of nearby galaxies. [5]
- (b) A Cepheid in an external galaxy is estimated to have a luminosity 10,000 times that of our sun, and its apparent visual band magnitude is $m_V = 24.83$. Given that the Sun has absolute magnitude $M_V = 4.83$, estimate the distance of the galaxy in which this variable star resides. [5]
2. (a) Discuss the nature of the “Main Sequence” on the Hertzsprung-Russell diagram, and explain why the Main Sequence lifetime is shorter for more massive stars. [5]
- (b) When our sun becomes a red giant, its luminosity is expected to grow to $\sim 1000 L_\odot$, whilst its temperature drops to ~ 3000 K. Using a blackbody approximation, estimate its radius at this time, and comment on the implications for the inner planets. [5]
3. (a) Explain carefully one of the lines of evidence for the hypothesis that most of the mass in the Universe is “dark matter”. [5]
- (b) Discuss the long term future of our Galaxy, in the light of what we know about the nature of star formation, the local environment of the Milky Way, and the evolution of the Universe. [5]