3 The Earth may be assumed to be an isolated uniform sphere with its mass M concentrated at its centre. A satellite of mass m orbits the Earth in a circular path of radius R.

For the satellite in its orbit, show that

(a) (i) its kinetic energy E_K is given by

$$E_K = \frac{GMm}{2R}$$

where G is the gravitational constant.

[3]

(ii) its total energy E_T is given by

$$E_T = -\frac{GMm}{2R}$$

[2]

(b) The satellite in **(a)** gradually loses energy due to small resistive forces.
Suggest why many such satellites eventually "burn up" in the Earth's atmosphere.

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……. [3]

(c) Polar orbiting satellites have orbits over the poles of the Earth. Geostationary satellites are in equatorial orbits.

State one advantage and one disadvantage of the use of a geostationary satellite as compared with a polar orbiting satellite.

(i) advantage:

….....

..... [1]

(ii) disadvantage:

….....

..... [1]

[Total: 10]