Question 5

A local government treasury department is designing software to work out the total yearly tax due on properties in the area. Since there are different rules for taxing residential properties (houses) and commercial properties (shops), it was decided to introduce a hierarchy of classes. At the top is the Property, which holds the owner’s name and the estimated property value (these are passed as constructor’s parameters). There are two subclasses, House and Shop, derived from Property. Each house is assigned a band, depending on its value: the band is 0 if the value does not exceed 100000, 1 if it is between 100000 and 500000, and 2 if it exceeds 500000. The tax payable on a house is computed as value\*(r1 + r2\*band), where r1 and r2 are two double numbers passed as constructor’s parameters. The tax payable on a shop is computed as value\*r, where r is a double number passed as constructor’s parameter.

(i) Implement a Property class.[3 Marks]

(ii)Implement a House class, including a method called houseTax, which returns the tax payable on that house.[8 marks]

(iii)Implement a Shop class, including a method called shopTax, which returns the tax payable on that shop.[6 marks]

(iv)Write a method called totalTax, which takes as parameters two ArrayLists, one containing houses and the other containing shops, and returns the total tax payable on all these properties.[8 marks]

Question 5  
Answer:  
A possible solution is given below:  
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(i) class Property  
{  
 protected String owner;  
 protected double value;  
 Property(String s, double d)  
 {  
 owner = s;  
 value = d;  
 }  
}

-------------------------------------------------------  
(ii) class House extends Property  
{  
 private double r1,r2;  
 private int band;  
 House(String o, double v, double rt1, double rt2)  
 {  
 super(o,v);  
 r1 = rt1; r2 = rt2;  
 if (value <= 100000) band = 0;  
 else if (value <= 500000) band = 1;  
 else band = 2;  
 }  
 double houseTax()  
 {  
 return value\*(r1 + r2\* band);  
 }  
}

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(iii)

class Shop extends Property  
{  
 private double r;  
 Shop(String o, double v, double rt)  
 {  
 super(o,v);  
 r = rt;  
 }  
 double shopTax()  
 {  
 return value\*r;  
 }  
}

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(iv) static double totalTax(ArrayList<House> a1,ArrayList<Shop> a2)  
{  
 double total = 0;  
 for (House h : a1) total += h.houseTax();  
 for (Shop s : a2) total += s.shopTax();  
 return total;  
}



