Question 10 **(13 marks)**

Matt is saving up to purchase a new boat. He deposits $14 500 into a savings account which is compounded monthly. The account pays an annual interest rate of 4.8% and he also deposits $300 into the account at the end of each month.

(a) (i) Calculate the monthly interest rate. (1 mark)

(ii) Determine a recursive rule to model the balance of the savings account at the end of each month. (2 marks)

(b) After how many months will the balance of Matt's account first exceed $20 000? (2 marks)

After four years, Matt makes a one-off deposit of $2500 into the savings account. His goal is to have a total of $50 000 by the end of the fifth year.

(c) Determine the equal monthly deposits during the fifth year he will need to make to reach this amount. (5 marks)

(d) Matt purchases his new boat, which costs him $47 500. He decides to take the remaining money and re-invest it in one of the following high-interest savings accounts.

Option 1: 5.52% per annum, compounded six-monthly.

Option 2: 5.5% per annum, compounded quarterly.

Determine which option Matt should choose, by calculating the effective annual rates of interest. (3 marks)