Question 26 (7 marks)

Tina inherits \$60 000 and invests it in an account earning interest at a rate of 0.5% per month. Each month, immediately after the interest has been paid, Tina withdraws \$800.

The amount in the account immediately after the nth withdrawal can be determined using the recurrence relation

$$A_n = A_{n-1}(1.005) - 800,$$

where $n = 1, 2, 3, \ldots$ and $A_0 = 60\,000$.

(a) Use the recurrence relation to find the amount of money in the account immediately after the third withdrawal. **2**

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Question 26 continues on page 29

Question 21 (4 marks)

Eli is choosing between two investment options.

Option 1: Depositing a single amount of $40 000 today, earning interest of 1.2% per annum, compounded monthly.

Option 2: Depositing $1000 at the end of each quarter, earning interest of 2.4% per annum, compounded quarterly.

A table of future value interest factors for an annuity of $1 is shown.

r / N	*Interest rate per period as a decimal*					
	0.002	0.006	0.020	0.024	0.060	0.240
10	10.09048	10.27437	10.94972	11.15211	13.18079	31.64344
20	20.38460	21.18211	24.29737	25.28909	36.78559	303.60062
30	30.88646	32.76227	40.56808	43.20983	79.05819	2640.91639
40	41.60026	45.05630	60.40198	65.92708	154.76197	22 728.80260

(a) What is the value of Eli's investment after 10 years using Option 1? **2**

.....

.....

.....

.....

(b) What is the difference between the future values after 10 years using Option 1 and Option 2? **2**

.....

.....

.....

.....

.....

.....

Question 32 (7 marks)

In a reducing-balance loan, an amount $\$P$ is borrowed for a period of n months at an interest rate of 0.25% per month, compounded monthly. At the end of each month, a repayment of $\$M$ is made. After the nth repayment has been made, the amount owing, $\$A_n$, is given by

$$A_n = P(1.0025)^n - M\left(1 + (1.0025)^1 + (1.0025)^2 + \cdots + (1.0025)^{n-1}\right).$$

(Do NOT prove this.)

(a) Jane borrows \$200 000 in a reducing-balance loan as described. **2**

The loan is to be repaid in 180 monthly repayments.

Show that $M = 1381.16$, when rounded to the nearest cent.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Question 32 continues on page 33

Question 15 (5 marks)

A table of future value interest factors for an annuity of $1 is shown.

Period \ Rate	*1.5%*	*3%*	*4.5%*	*6%*
5	5.152	5.309	5.471	5.637
10	10.703	11.464	12.288	13.181
20	23.124	26.870	31.371	36.786
40	54.268	75.401	107.030	154.762

(a) Micky wants to save $450 000 over the next 10 years. **2**

If the interest rate is 6% per annum compounding annually, how much should Micky contribute each year? Give your answer to the nearest dollar.

.....

.....

.....

.....

(b) Instead, Micky decides to contribute $8535 every three months for 10 years to an annuity paying 6% per annum, compounding quarterly. **3**

How much will Micky have at the end of 10 years?

.....

.....

.....

.....

.....

.....

Question 25 (6 marks)

On the first day of November, Jia deposits \$10 000 into a new account which earns 0.4% interest per month, compounded monthly. At the end of each month, after the interest is added to the account, Jia intends to withdraw \$$M$ from the account.

Let A_n be the amount (in dollars) in Jia's account at the end of n months.

(a) Show that $A_2 = 10\,000(1.004)^2 - M(1.004) - M$. **1**

.....

.....

.....

.....

(b) Show that $A_n = (10\,000 - 250M)(1.004)^n + 250M$. **3**

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Question 25 continues on page 27

Question 25 (3 marks)

A table of future value interest factors for an annuity of $1 is shown. **3**

Table of future value interest factors

Number of periods	*Interest rate per period*				
	0.25%	0.5%	0.75%	1%	1.25%
2	2.0025	2.0050	2.0075	2.0100	2.0125
4	4.0150	4.0301	4.0452	4.0604	4.0756
6	6.0376	6.0755	6.1136	6.1520	6.1907
8	8.0704	8.1414	8.2132	8.2857	8.3589
10	10.1133	10.2280	10.3443	10.4622	10.5817

Simone deposits $1000 into a savings account at the end of each year for 8 years. The interest rate for these 8 years is 0.75% per annum, compounded annually.

After the 8th deposit, Simone stops making deposits but leaves the money in the savings account. The money in her savings account then earns interest at 1.25% per annum, compounded annually, for a further two years.

Find the amount of money in Simone's savings account at the end of ten years.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Question 29 (5 marks)

(a) On the day that Megan was born, her grandfather deposited \$5000 into an account earning 3% per annum compounded annually. On each birthday after this, her grandfather deposited \$1000 into the same account, making his final deposit on Megan's 17th birthday. That is, a total of 18 deposits were made. **2**

Let A_n be the amount in the account on Megan's nth birthday, after the deposit is made.

Show that $A_3 = \$8554.54$.

.....

.....

.....

.....

.....

.....

.....

.....

.....

Question 29 continues on page 31