QUESTION 1 (10 marks)

a) Find the 15th term of these sequences. (To 2 decimal places)

    i) 5, 8, 11, $\cdots$ [2]

    ii) 2, 2.2, 2.42, $\cdots$ [2]

b) Evaluate $\sum_{r=1}^{20} 2r + 3$ [3]

c) The second term of a G.P. is $\frac{1}{3}$ and the sixth term is 27. Find the third term.   [3]

QUESTION 2 (9 marks)

a) Mr. Smith gets a job with a starting salary of $350 a week. He gets a $5 increase in pay each week for 52 weeks.

    i) Find his pay during the 52nd week.   [2]

    ii) Find his total pay for the 52 weeks.   [2]

    iii During what week will his weekly income first exceed $550.   [3]

b) A tree grows so that its increase in height in one year is 80% of the previous years increase. Find its maximum height if it is 2 metres tall at the end of its first year.   [2]

QUESTION 3 (9 marks)

a) Solve, giving answer to two decimal places $500(1.05)^x = 2000$ [2]

b) For the function $y = xe^x$

    i) Show $\frac{dy}{dx} = e^x(x+1)$ [2]

    ii) Find any stationary points.   [2]

    iii) Find the second derivative and use it to find the nature of any stationary point.   [3]

QUEATION 4 (9 marks)

a) Simplify $\log_5 100 - \log_5 20$ [2]

b) If $y = e^{-x} - 1$

    i) Find y (to 2 decimal places) when x=2 and when x=-0.5   [2]

    ii) Draw a sketch of the graph of this function indicating the coordinates of all intercepts.   [2]

c) Evaluate giving exact answer. $\int_0^1 (e^{2x} - 1)dx$ [3]

QUESTION 5 (10 Marks)

a) Brutus is going to make two contributions to his superannuation fund. The first is a lump sum of $25000. The other will be a monthly contribution of $350 paid at the beginning of each month. The fund earns interest at a rate of 9% p.a. (compounded monthly).   1.0075

    i) Find the value of the $25000 after 15 years.   [2]

    ii) Find the total value of his investment after 15 years (this includes both the lump sum payment and the monthly payments).   [4]

b) A layer of plastic cuts out 15% of the light and lets through 85%.

    i) Show that two layers of plastic let through 72.25% of light.   [1]

    ii) Form an exponential inequation and use it to find how many layers of plastic are required to cut out at least 90% of light?   [3]