ADVANCED PROGRAMME MATHEMATICS: PAPER II

QUESTION 4

The manufacturer of a particular mobile phone claims that the mean battery life is 12 hours. A consumer organisation wished to test whether the mean is actually less than 12 hours. They invited a random sample of members to report the battery life of the mobile phones. They then calculated the sample mean. Unfortunately, a fire destroyed the records of this test except for the following partial document.

Test of the mean battery of phone	
Sample size (n)	
Sample mean (*hours*)	11,7
Significant at the 5% level	Yes
Significant at the 2,5% level	No

4.1 State the null and alternate hypotheses that would be used for this test. (2)

4.2 Given that the population of battery lives is normally distributed with a standard deviation of 0,5 hours, find the set of possible values of the sample size, *n*. (10)

[12]

QUESTION 5

5.1 Consider the game where two people play rock-paper-scissors. Scissors beats paper, paper beats rock and rock beats scissors. Sam and Charlie play a game to decide who gets to wash the dishes after dinner. The loser of the game must wash the dishes.

It is found that Sam chooses rock 36% of the time, paper 32% of the time and scissors 32%. Charlie chooses rock 22% of the time, paper 25% of the time and scissors 53% of the time. If the choices are made independently of each other, what is the probability that Sam has to wash the dishes? [Assume that they only play one round] (8)

5.2 At a final prize-giving ceremony there are three annual sports prizes, one for Best Sportsman, one for Most Improved Sportsman, and one for Best Sportsmanship that are to be awarded in a group of 20 students.

Find the number of different ways in which the three prizes can be awarded if:

(a) no student may win more than one prize. (5)

(b) no student may win all three prizes. (5)

[18]

MODULE 3   FINANCE AND MODELLING

QUESTION 1

Mr Fourie deposits an amount of R1 500 per month in an account, starting immediately, with an effective interest rate of 7,75% per annum. After three years the amount is increased to x rand per month with the interest rate unchanged. After a total of seven years, the balance of the account is R206 530,90.

1.1   Determine the balance in the account after three years, correct to the nearest ten rand.   (6)

1.2   Assuming that the balance in the account after three years is R62 210, calculate x, correct to the nearest rand.   (9)
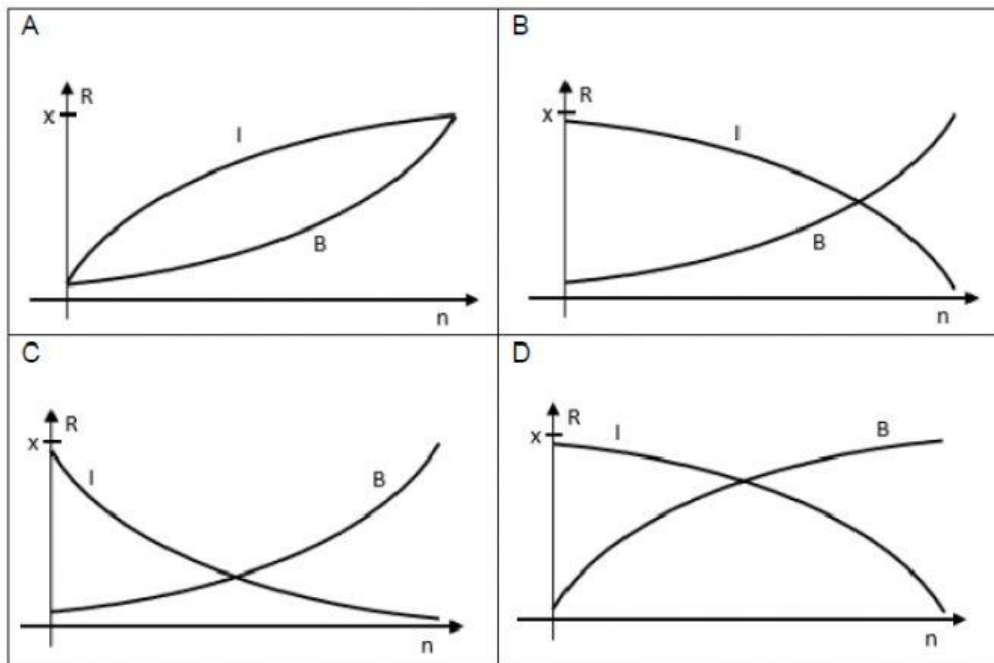
- - --

QUESTION 2

2.1 Consider a loan, charging compound interest, that is to be repaid with a monthly payment of *x* rand over *n* months.

Let I = the part of the monthly payment that goes to paying the interest.

Let B = the part of the monthly payment that reduces the outstanding balance.

State which of the following graphs best describes the changing value of I and B over the period of the loan, and give a valid reason for your answer.

(2)

2.2   Nandi takes a home loan, to be amortised over 15 years, with interest charged at 11,25% per annum compounded monthly. Her first payment is made after eight months. After four years, the balance outstanding is R317 279,95.

(a)   Calculate the monthly payment, correct to the nearest rand.   (5)

(b)   Calculate the amount of the original loan, correct to the nearest cent.   (7)

(c)   Find the total interest paid, in rand, over the first four years, that is, starting from when the loan was granted.   (6)

(d)   Nandi misses the 42nd and 43rd payments.

Given that the time period of the loan remains unchanged, calculate the revised payment required after the missed payments.   (8)

[30]