



# University of Fort Hare

AMB111F

Degree Examinations: June 2017

Subject: Mathematics

Paper: Business Mathematics 1F

Time: 3 Hours

Marks: 100

Subminimum: 40

**This question paper consists of 4 pages**

**Internal examiner(s)**

**External examiner(s)**

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## Instructions

Answer **FIVE** questions. Symbols used have the usual meanings.

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**AMB111F Exam 2017**  
Instructions: Answer FIVE questions.

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## Question One

- 1.1 Let  $A = (-2, 5]$  and  $B = [2, 8)$ . Find , with an aid of a number line, (a)  $A \cap B$ ; (b)  $A \cup B$ ; (c)  $A - B$ ; (d)  $A \Delta B$ . (6)
- 1.2 Find the domain and the range of the function  $f(x) = \sqrt{3 - 4x}$ , expressing your answer as an interval or combination of intervals. (3)
- 1.3 Let  $f : R \rightarrow R$  be given by  $f(x) = x^2 - 7x + 10$ . Find (a)  $f^{-1}(4)$ ; (b)  $f(f(2))$  (4)
- 1.4 If  $x + 2$  is a factor of  $f(x) = x^3 - 7ax - 20$ , determine  $a$ . Hence express  $x^3 - 7ax - 20$  as a product of a linear factor and a quadratic factor. (5)
- 1.5 Let  $L$  be the line  $2y = 6x - 8$ . Find the equation of the line (a)  $L_1$  passing through  $(2, -3)$  and parallel to  $L$   
(b)  $L_2$  passing through  $(3, -2)$  and perpendicular to  $L$ .  
Sketch all 3 lines on the same coordinate system. (8)
- [26]

## Question Two

- 2.1 Discuss and draw the graph of  $y = x + |x|$ . (3)
- 2.2 Graph the region  $4x + 2y - 8 \geq 0$ . (3)
- 2.3 **Discuss** and draw the graph of the equation  $y = -x^2 - 2x + 15$ . (5)
- 2.4 Solve the inequality  $3x^2 + x - 2 \geq 0$  using the **sign table method** and then illustrate its solution on a number line. (5)

- 2.5 Solve for  $x$  if (a)  $5^x - 5^{x-1} = 20$  (3)  
 (b)  $2^{x^2} = 256$  (2)
- 2.6 Solve for  $x$  if (a)  $(0, 01)^x = 1000$  (2)  
 (b)  $x^{3/2} = 64$  (2)
- [25]

### Question Three

- 3.1 Solve for  $x$  and  $y$  if  $8^x = 16 \times 2^{y-1}$  and  $9^{3x} = 3^{3y}$ . (3)
- 3.2 Solve for  $x$  if  $\log_3(x+4) - \log_3(x+1) = 1$ . (3)
- 3.3 Discuss and draw the graph of the equation  $y = \log_2 \frac{1}{2-3x}$ , showing asymptotes and intercepts. (5)
- 3.4 Find all values of  $x$  satisfying the inequality  $\log_{(2/3)}(2x+3) < 6$ . (4)
- 3.5 Discuss and draw the graph of the equation  $y = -1 + 2^{x-1}$ , showing asymptotes and their equations. (4)
- 3.6 In an arithmetic series, the 4th term is  $-1$  and the 7th term is  $-13$ . Find the number of terms in the series if the sum is  $-24$ . (6)
- [25]

### Question Four

- 4.1  $x$ ;  $x-1$  and  $x+1$  are the first 3 terms of a geometric sequence. Find the constant ratio  $r$  and the 16th term. (4)
- 4.2 The 3rd term of a geometric series is 50 and the 5th term is 1250. Find the sum of the series to 16 terms. (6)
- 4.3 Use series to convert  $0,03\bar{1}$  into a vulgar (rational) fraction. (4)
- 4.4 The common difference of an arithmetic series is  $-3$  and the sum of the first 18 terms is 380. Find the first term. (4)

- 4.5 The first term of a geometric series is 6 and the last term is 96. The sum of the series is 186. (a) Find the constant ratio  $r$  and (b) the number of terms in the series. (5)  
[23]

## Question Five

- 5.1 Calculate how long it takes R10 500 to become R350 500 if it is invested at 13 % compound interest per annum (a) calculated half-yearly; (b) calculated monthly. (6)
- 5.2 Factory machinery depreciates at a rate of 13 % annually. Calculate how long it will take for the cost of a machinery to become one quarter of the original value. (4)
- 5.3 Calculate the future value of the annuity in which R4500 is invested at the beginning of each half-year for 15 years at an interest rate of 11% p.a. compounded half-yearly. (4)
- 5.4 Nandi has an annuity to which she contributes R22000 p.a. (at the end of the year) at 9,5% annual compound interest. The annuity will mature in 28 years. Calculate the present value of the annuity. (4)
- 5.5 Calculate the total cost of repaying a house loan of R1 725 000 at 11 % p.a. in equal monthly repayments over a 30-year period. Calculate also the monthly instalments. (5)  
[23]

## Question Six

- 6.1 A hydraulic lifter costs R965 000 and is expected to have a useful lifetime of 12 years. It depreciates at 8 % p.a. on the reducing balance basis. The cost of a replacement lifter is expected to escalate at 14 % p.a. effective. A sinking fund is set up to finance the replacement hydraulic lifter in 12 years' time. Find, at the time of purchase of the new hydraulic lifter:  
(a) the scrap value of the old hydraulic lifter,  
(b) the expected cost of a new hydraulic lifter,

- (c) the value the sinking fund must attain if the scrap value of the old hydraulic lifter is used to defray expenses,  
 (d) the value of the monthly installments that are made into the sinking fund if payments start immediately and end on the day of the replacement and the sinking fund earns interest of 12 % p.a. compounded monthly. (7)

- 6.2 There are two fish tanks in a pet shop. In tank A there are 3 white fish and 4 black fish. In tank D there are 5 white fish and 2 black fish. One fish is taken out of each tank at random. (a) Find the probability that the fish taken from tank A will be (i) black; (ii) white. (b) Draw a tree diagram showing all the probabilities when one fish is taken out of each tank at random. (c) Work out the probability that (i) the two fish will both be white; (ii) the two fish will be of different colours. (5)

- 6.3 The table below shows the times, in minutes, spent on homework one evening by a group of students:

Time	$0 \leq t < 10$	$10 \leq t < 20$	$20 \leq t < 30$	$30 \leq t < 40$	$40 \leq t < 50$	$50 \leq t < 60$
No. of stud. (Frequency)	9	12	31	26	19	15

- (a) Draw up a cumulative frequency table for the data and hence draw a cumulative frequency graph (called an ogive) for the data.  
 (b) Use the graph to estimate the median of the data.  
 (c) Use the graph to estimate the Interquartile Range of the data. (8)
- 6.4 The following are the marks (in %) of students in class A for an exam in Mathematics:  
 6 10 22 32 30 30 35  
 39 44 49 52 52 52 52  
 54 60 63 63 63 82 90  
 99.  
 Compute the: (a) mean, (b) median, (c) mode , (d) Interquartile range, (e) Standard Deviation of the given data, using the **formulae studied in the course.** (8)

END

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