DSC1630
(476581)
May/June 2017

INTRODUCTORY FINANCIAL MATHEMATICS
DEPARTMENT OF DECISION SCIENCES

Duration 2 Hours 100 Marks

EXAMINERS:
FIRST
SECOND
MRS MF IMMELMAN
DR JE SINGLETON

Programmable pocket calculator is permissible
Closed book examination.

This examination question paper remains the property of the University of South Africa and may not be
removed from the examination venue

This paper consists of 21 pages, including a list of formulas, a table with the number of each day of the
year, nine sheets of paper for rough work and instructions for completing a mark-reading sheet

Please complete the attendance register on the back page,
tear it off and hand it to the invigilator

Answer all questions on the mark-reading sheet supplied Follow the instructions for completing the
mark-reading sheet carefully Also pay attention to the following

• Only ONE option (indicated as [1] [2] [3] [4] [5]) per question is correct Do not mark more than
  one option per question on the mark-reading sheet

• Marks will not be deducted for incorrect answers

• There are 30 questions for a total of 100 marks

You are strongly advised to write your name on the mark-reading
sheet. Then, if you have entered your student number incorrectly,
we will still be able to link you to the mark-reading sheet
Question 1
Mary needs R300,00 now. Rachel is prepared to lend her the money on the condition that she pays her R315,00 five months from now. The simple interest rate that Rachel earns on this transaction is

[1] 2.08%
[2] 12.00%
[3] 15.00%
[4] 1.00%
[5] none of the above

Question 2
The accumulated amount that Samat will receive after 52 months if he deposits R7 300 into an account earning 9.7% interest per year, compounded every second month, is

[1] R7 825.36
[2] R8 388.53
[3] R10 368.43
[4] R11 076.73
[5] none of the above

Question 3
Payments of R5 000 each are made into an account at the end of every quarter. The account earns interest at a rate of 9.5% per year, compounded quarterly. The accumulated amount after ten years is

[1] R327 821.53
[2] R128 197.89
[3] R995 403.41
[4] R77 801.45
[5] none of the above

Question 4
Paulina borrows money from the bank at a discount rate of 9.98%. She must pay the bank R35 000 in 30 months’ time. The amount of money that she receives from the bank now is

[1] R26 267.50
[4] R43 732.50
[5] R45 635.58
ROUGH WORK
Question 5
If Jack Parrow earns a nominal interest rate of 10.5% per annum, compounded at the end of every month, on a savings account, then the effective interest rate is

[1] 0.88%
[2] 2.31%
[3] 10.5%
[4] 11.02%
[5] none of the above

Question 6
27 months from now, Michelle must pay Johnson R35 000. However, she decides to pay him 14 months from now. If a simple interest rate of 10.2% per year is applicable, then the amount Johnson will receive 14 months from now is

[1] R28 466.86
[2] R31 132.50
[3] R31 277.93
[4] R31 517.33
[5] R31 854.41

Question 7
John deposits R900 into a savings account paying 6.5% interest per year, compounded quarterly. After three and a half years he withdraws R1 000 from the account and deposits it into a second account paying 11% simple interest per year. What is the total amount accrued in the first account two years after he withdrew the R1 000? The correct answer, rounded to the nearest rand, is

[2] R145
[4] R1 105
[5] none of the above

Question 8
You are quoted a simple discount rate of 14.29% for eight months. The equivalent simple interest rate is

[1] 6.67%
[2] 9.53%
[3] 13.05%
[4] 14.29%
[5] 15.79%
ROUGH WORK
Question 9
Sweetness wants to buy a new car on a promotion coming up on 15 July 2017. On 4 March 2017 she deposits R450 000 in an account earning 7.65% interest per year, compounded monthly. Interest is credited on the 1st day of each month. If fractional compounding is used for the full term, then the amount that Sweetness will have available on 15 July 2017 will be

[1] R462 703,60
[4] R451 045,18

Question 10
A banker has collected the following sample of data of the number of loans he approved per day during the past week

3 5 12 3 2

The variance of the data set is

[1] 4,1
[2] 13,2
[3] 16,5
[4] 80,0

Question 11
An interest rate of 19.9% per year, compounded quarterly, is equivalent to a weekly compounded rate of

[1] 19,42%
[2] 19,46%
[3] 19,86%
[4] 20,36%
[5] 21,43%
ROUGH WORK
Question 12
Jacob took out a retirement annuity with an annual payment of R6 500 that increases by R1 700 each year. If money is worth 10% per annum, then the annuity is worth after 20 years

[1] R200 068,74
[4] R1 005 962,49
[5] none of the above

Question 13
You must choose between two investments, A and B. The profitability index (PI), net present value (NPV) and internal rate of return (IRR) of the two investments are as follows

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Investment A</th>
<th>Investment B</th>
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<tr>
<td>NPV</td>
<td>-10 000</td>
<td>22 000</td>
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<tr>
<td>PI</td>
<td>1,945</td>
<td>0,071</td>
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<tr>
<td>IRR</td>
<td>6,00%</td>
<td>18,04%</td>
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</tbody>
</table>

Which investment/s should you choose, taking all the above criteria into consideration, if the cost of capital is equal to 10% per year?

[1] A
[2] B
[3] Both A and B
[4] Neither A nor B
[5] Too little information to make a decision

Question 14
A student registered for a four-year degree. She has a fund of R40 000 available to cover expenses over the next four years. The amount of periodic withdrawals at the beginning of each month if the interest rate is 7,5% per year, compounded monthly, is

[1] R833,33
[2] R712,70
[3] R961,15
[4] R967,16
[5] none of the above
ROUGH WORK
Questions 15 and 16 are based on the following information:

Hip-hop Handbags sells leather bags. The following table represents the selling price of the bag (x) in rand and the number of bags sold at that price (y).

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<th>500</th>
<th>900</th>
<th>1500</th>
<th>2000</th>
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<td>15</td>
<td>19</td>
<td>7</td>
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Question 15

The correlation coefficient of a linear regression between x and y is approximately

1. \( r = -0.16428 \)
2. \( r = 0.16428 \)
3. \( r = 4 \)
4. \( r = 5.72276 \)
5. none of the above

Question 16

The shop manager suspects a linear relationship between the two variables. Fit a curve of the form \( y = a + bx \) to the data. The equation representing the linear relationship is

1. \( y = 9.48566x - 0.00164 \)
2. \( y = 0.00164x + 9.48566 \)
3. \( y = 0.00164x - 9.48566 \)
4. \( y = 9.48566x + 0.00164 \)
5. none of the above

Question 17

The Army Fund was created for Long John after he had lost a leg in a battle. The fund has undertaken to pay him R19,000 every second month indefinitely. If an interest rate of 9.5% per year, compounded every second month, is applicable, then the opening balance of the fund is

1. R1 189 224
2. R1 200 000
3. R2 000 000
4. R2 115 882
5. R2 400 000
Questions 18 and 19 are based on the following information
Suppose Solly can afford a monthly payment of R1 480 and has obtained a three-year loan of R44 240,35
The loan is financed at 12.5% interest per year, compounded monthly

Question 18
The interest due at the end of the first month is

[1] R43 221,19
[2] R5 530,04
[3] R1 019,19
[4] R460,84
[5] none of the above

Question 19
Considering the amortisation schedule, the principal repaid after the first month is

[1] R460,84
[2] R43 221,19
[3] R1 019,16
[4] R1 029,78
[5] none of the above

Question 20
Consider Stock AAA
Coupon rate (half yearly) 10.5% per year
Yield to maturity 7.955% per year
Maturity date 8 November 2047
Settlement date 29 May 2017
The value of n, the number of half years from the next coupon date until maturity, is

[1] 30
[2] 58
[3] 60
[4] 47
[5] none of the above
ROUGH WORK
Question 21

The MIRR of the Copy and Make Shop over a time period of ten years is 32.7%. The present value of the cash outflows is R20 514. Therefore the future value of the cash inflows is approximately

[1] R205 140
[2] R347 344
[3] R670 808
[4] R691 321

Questions 22 and 23 are based on the following situation:

David is considering investing in an investment with an initial outlay of R500 000. He is expecting five successive annual cash inflows of R75 000, R190 000, R40 000, R150 000 and R180 000 respectively. The cost of capital c is 10% per annum.

Question 22

The nett present value (NPV) is approximately

[2] -R135 000
[3] R135 000
[5] none of the above

Question 23

The profitability index (PI) is

[1] 0.27000
[2] 0.34369
[3] 0.65631
[4] 0.93895
[5] none of the above

Question 24

If \( S = Pe^{ct} \) then \( t \) equals

[1] \( \frac{\ln \frac{s}{c}}{c} \)
[2] \( \frac{s-c}{c-P} \)
[3] \( \frac{s+P}{c-t} \)
[4] \( \ln \frac{s-c}{c} \)
[5] \( \ln(\frac{s}{c}) \)
ROUGH WORK
Question 25
John Drake took out a loan on his truck, subject to making the following payments

R10 000 after six months
R20 000 after a year
R40 000 after two years

As a result of drought on his farm, he could not make the first two payments. After 18 months he had a record harvest and immediately made a down payment of R50 000 against his loan. The interest rate charged on all amounts is 13% per year, compounded annually. The single payment, rounded to the nearest rand, that he should make two years after taking out the loan to settle his debt is

[1] R21 461
[2] R21 300
[5] none of the above

Question 26
Mike deposits R1 500 at the end of every month into an account that earns 12.5% interest per year, compounded monthly. After two years, he stops making these monthly contributions because the interest rate changes to 15% per year, compounded every two months. If he leaves the money in the account and no withdrawals or deposits are made for four years, the balance in the account will be

[4] R72 517,49
[5] R73 544,10

Question 27
After making a down payment of R5 000 on an off-road bicycle, Chase also had to pay an additional R700 per month for it for three years. Interest was charged at 14.5% per year, compounded monthly, on the unpaid balance. The original price of the bicycle is

[1] R6 611,60
[5] none of the above
ROUGH WORK
Question 28

The equation for the present value of Bond OPE on 24/6/2017 is given by

\[ P(24/6/2017) = 7.35a_{2890.135-2} + 100 \left( 1 + \frac{0.135}{2} \right)^{-29} \]

and the fraction of the half year to be discounted back is 74/181. The all-in price of the bond is

[1] R104,71756%
[2] R107,55174%.
[3] R111,87388%
[4] R114,90174%
[5] none of the above

Question 29

The next coupon date that follows the settlement date of a bond is 28 October 2017. If the settlement date is 11 September 2017 and the half-yearly coupon rate is 7.35%, the accrued interest of the bond is

[1] R0,94644%
[2] R1,89288%
[3] R3,68507%
[4] R5,47726%
[5] R7,37014%

Question 30

Dieter owes Paul R3000, due ten months from now, and R25 000, due 32 months from now. Dieter asks Paul if he can discharge his obligations by two equal payments— one now and the other one 28 months from now. Paul agrees on condition that a 14.75% interest rate, compounded every two months, is applicable. The amount that Dieter will pay Paul 28 months from now is approximately

[1] R11 455
[2] R11 511
[5] R20 000
ROUGH WORK
The number of each day of the year

For leap years, add one to the number of every day after February 28

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<td>365</td>
<td>31</td>
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</tbody>
</table>
FORMULAS

\[ I = Prt \]
\[ S = P(1 + rt) \]
\[ P = S(1 - dt) \]
\[ S = P \left( 1 + \frac{J_m}{m} \right)^{tm} \]
\[ J_{eff} = 100 \left( \left( 1 + \frac{J_m}{m} \right)^{tm} - 1 \right) \]
\[ S = Pe^{ct} \]
\[ J_{\infty} = 100(e^c - 1) \]
\[ c = m \ln \left( 1 + \frac{J_m}{m} \right) \]
\[ J_m = m \left( e^\frac{c}{m} - 1 \right) \]
\[ J_n = n \left( \left( 1 + \frac{J_m}{m} \right)^{\frac{n}{m}} - 1 \right) \]
\[ S = R \left( \frac{(1 + r)^n - 1}{r} \right) \]
\[ S = Rs_{\text{final}} \]
\[ P = Ra_{\text{final}} \]
\[ P = R \left( \frac{(1 + r)^n - 1}{n(1 + r)^n} \right) \]
\[ A = nR + Q \left[ \frac{n(n - 1)}{2} \right] \]

\[ r = \frac{d}{1 - dt} \]
\[ S = (1 + r)Rs_{\text{final}} \]
\[ P = (1 + r)Ra_{\text{final}} \]
\[ P = da_{\text{final}} + 100(1 + z)^{-n} \]
\[ H - R \times \frac{365}{c} \]
\[ -R \times \frac{365}{c} \]
\[ MIRR = \left( \frac{C}{PV_{\text{out}}} \right)^\frac{1}{n} - 1 \]
\[ PI = \frac{\text{NPV} + \text{original investment}}{\text{original investment}} \]
\[ P = \frac{R}{i} \]
\[ S = \left[ R + \frac{Q}{i} \right] s_{\text{final}} - \frac{nQ}{i} \]
\[ T_r = Ra_{\text{final}} - P \]
\[ \bar{x} = \frac{\sum_{i=1}^{n} x_i}{n} \]
\[ \bar{x}_w = \frac{\sum_{i=1}^{n} x_i w_i}{\sum_{i=1}^{n} w_i} \]
\[ \sum_{i=1}^{n} i = \frac{n(n + 1)}{2} \]
\[ S = \sqrt{\frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n - 1}} \]
\[ y = a + bx \]
### PART 1 (GENERAL/ALGEMEEN) DEEL 1

<table>
<thead>
<tr>
<th>STUDY UNIT</th>
<th>INITIALS AND SURNAME</th>
<th>STUDENT NUMBER</th>
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**For use by examination invigilator**

Vir gebruik deur eksamenopskieners

### IMPORTANT

1. **USE ONLY AN HB PENCIL TO COMPLETE THIS SHEET**
2. **MARK LIKE THIS**
3. **CHECK THAT YOUR INITIALS AND SURNAME HAS BEEN FILLED IN CORRECTLY**
4. **ENTER YOUR STUDENT NUMBER FROM LEFT TO RIGHT**
5. **CHECK THAT YOUR STUDENT NUMBER HAS BEEN FILLED IN CORRECTLY**
6. **CHECK THAT THE UNIQUE NUMBER HAS BEEN FILLED IN CORRECTLY**
7. **CHECK THAT ONLY ONE ANSWER PER QUESTION HAS BEEN MARKED**
8. **DO NOT FOLD**

### PART 2 (ANSWERS/ANTWÓRDE) DEEL 2

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</tbody>
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**Specimen only**

*UNISA MM142*
MARK READING SHEET INSTRUCTIONS

Your mark reading sheet is marked by computer and should therefore be filled in thoroughly and correctly

USE ONLY AN HB PENCIL TO COMPLETE YOUR MARK READING SHEET

PLEASE DO NOT FOLD OR DAMAGE YOUR MARK READING SHEET

Consult the illustration of a mark reading sheet on the reverse of this page and follow the instructions step by step when working on your sheet

Instruction numbers 1 to 10 refer to spaces on your mark reading sheet which you should fill in as follows

1. Write your paper code in these eight squares, for instance

\[
\begin{array}{cccccc}
P & S & Y & 1 & 0 & 0 - X
\end{array}
\]

2. The paper number pertains only to first-level courses consisting of two papers

WRITE \[0 1\] for the first paper and \[0 2\] for the second. If only one paper, then leave blank

3. Fill in your initials and surname

4. Fill in the date of the examination

5. Fill in the name of the examination centre

6. WRITE the digits of your student number HORIZONTALLY (from left to right). Begin by filling in the first digit of your student number in the first square on the left, then fill in the other digits, each one in a separate square

7. In each vertical column mark the digit that corresponds to the digit in your student number as follows

[-]

8. WRITE your unique paper number HORIZONTALLY

NB Your unique paper number appears at the top of your examination paper and consists only of digits (e.g. 403326)

9. In each vertical column mark the digit that corresponds to the digit number in your unique paper number as follows

[-]

10. Question numbers 1 to 140 indicate corresponding question numbers in your examination paper. The five spaces with digits 1 to 5 next to each question number indicate an alternative answer to each question. The spaces of which the number correspond to the answer you have chosen for each question and should be marked as follows

\[
\begin{array}{c}
\bullet \\
\end{array}
\]

For official use by the invigilator. Do not fill in any information here