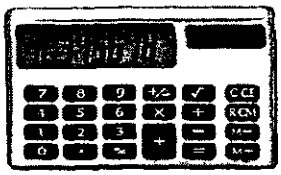
UNIVERSITY EXAMINATIONS



UNIVERSITEITSEKSAMENS

UNISA university of south africa

DSC1630 (476580) May/June 2016

INTRODUCTORY FINANCIAL MATHEMATICS
DEPARTMENT OF DECISION SCIENCES

Duration 2 Hours 100 Marks

EXAMINERS :
FIRST MRS MF IMMELMAN
SECOND . 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 23 pages including a list of formulæ, a table with the number of each day of the year, 10 sheets of paper for rough work plus 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

A loan of R30 000 is due eight months from now The applicable simple discount rate is 16,5% per year The present value of the loan is

[1] R26 700,00
[2] R27 027,03.
[3] R33 300,00
[4] R33 463,26
[5] R33 707,87.

Question 2

On 16 April, Mark deposited an amount of money into a savings account that earns 8,5% simple interest per year He intends to withdraw the balance of R2 599 on 8 December of the same year to buy his little sister a present for Christmas. The amount of money that Mark deposited is

[1] R2 460,03
[2] R2 461,82
[3] R2 463,60.
[4] R2 465,46
[5] none of the above.

Question 3

Frieda borrows R7 500 from the bank at an interest rate of 26,00% per year, compounded weekly The amount that Frieda will have to pay back after 78 weeks will be

[1] R10 425,00
[2] R10 607,60
[3] R11 031,32
[4] R11 066,60
[5] R11 430,24

Question 4

An interest rate of 19,9% per year, compounded quarterly, is equivalent to a weekly compound rate of

[1] 19,24%
[2] 19,46%
[3] 19,86%
[4] 20,36%
[5] 21,43%

ROUGH WORK

Question 5

If Nkosi earns a nominal interest rate of 16,5% per annum, compounded at the end of every second month, on a savings account, then the effective interest rate is

[1] 14,53%
[2] 16,18%
[3] 16,68%
[4] 17,68%.
[5] 18,00%

Question 6

The accumulated amount of quarterly payments of R5 000 deposited into a savings account for a period of ten years, earning interest at an interest rate of 9,5% per year, compounded quarterly, is

[1] R128 197,89
[2] R150 000,00
[3] R244 404,87
[4] R327 821,53
[5] none of the above

Question 7

How long will it take Mike to save R4 000 for a mountain bicycle if he deposits R100 at the end of every month into a savings account which pays 9% interest per annum, compounded monthly? Answers are given to the nearest month

[1] 18 months
[2] 35 months
[3] 48 months
[4] 494 months
[5] None of the above

Question 8

Jeremy owes R500 due in four months and R700 due in nine months If he wants to liquidate his obligations with a single payment in 18 months' time, how big should the payment be, if simple interest is calculated at 11% per annum? Use month 18 as the comparison date

[1] R1 128,97
[2] R1 299,00
[3] R1 321,92
[4] R1 328,04
[5] None of the above

ROUGH WORK

Question 9

A student is registered for a four-year degree She has a fund of R40 000 available to cover expenses over the next four years She withdraws the same amount from the fund at the beginning of each month. If the interest rate is 7,5% per year, compounded monthly, then the value of each monthly withdrawal is

[1] R833,33
[2] R712,70
[3] R961,15
[4] R967,16
[5] none of the above

Questions 10 and 11 relate to the following situation:
Dawn will discharge a debt of R200 000 six years from now while using the sinking fund method. The interest on the debt is 15,6% per year, paid quarterly. The sinking fund will earn interest at a rate of 8,4% per year, compounded monthly

Question 10

The monthly deposit into the sinking fund will be

[1] R1 694,44
[2] R2 145,84
[3] R2 777,78
[4] R5 183,41
[5] R6 494,38

Question 11

The total yearly cost to discharge the debt (to the nearest rand) will be

[1] R51 533
[2] R56 950
[3] R109 133
[4] R114 334
[5] none of the above

ROUGH WORK

Questions 12 and 13 relate to the following situation:
Ian has inherited R1 250 000 now, to be paid out as he chooses

Question 12

Assume that money is worth 7,91% per year, compounded quarterly If Ian chooses to be paid a fixed amount from his inheritance every three months for an *indefinite period* of time, the quarterly amount that he will receive from his inheritance will be

[1] R24 718,75
[2] R32 958,33
[3] R98 875,00
[4] R312 500,00.
[5] R416 666,67.

Question 13

However, instead of the quarterly payments Ian decides to receive his inheritance in just two payments one payment four years from now and one payment, three times the size of the first payment, ten years from now. If money is worth 12,6% per year, compounded half-yearly, the amount that Ian will receive four years from now is

[1] R312 500,00
[2] R399 009,36
[3] R509 467,09
[4] R834 783,87
[5] R2 037 868,37.

Question 14

An amount of R10 000 was invested in a special savings account on 15 May at an interest rate of 15% per annum compounded quarterly for seven months Interest is calculated on 1 January, 1 April, 1 July and 1 October of every year. If simple interest is used for the odd periods and compound interest for the rest of the term, the amount of interest received after seven months is

[1] R665,54
[2] R896,95
[3] R901,35
[4] R1 644,57
[5] none of the above

ROUGH WORK

Questions 15 and 16 relate to the following situation:
Nina suspects that there is a linear relationship between the different monthly contracts that can be taken out at a gym, and the number of contracts sold per year at all the branches She examines the following data of the gym's records over the past five years

Monthly contracts in rand	***Number of contracts sold per year at all the branches***
(x)	***(y)***
80	*5 000*
120	*5 500*
250	*6 000*
300	*4 250*
400	*2 000*

Question 15

The regression line equation is

[1] $y = -8{,}68x + 6\,547{,}46$
[2] $y = 6547{,}46x - 8{,}68$
[3] $y = -0{,}061x + 507{,}41$
[4] $y = 507{,}41x - 0{,}061$
[5] none of the above

Question 16

The correlation coefficient is

[1] $-0{,}7277$
[2] $-0{,}0609$
[3] $0{,}0609$
[4] $0{,}7277$
[5] none of the above

Question 17

If R35 000 accumulates to R48 320 at a continuous compounded rate of 8,6%, then the term under consideration is

[1] 2,77 years
[2] 3,75 years
[3] 3,91 years
[4] 4,43 years
[5] 6,23 years

ROUGH WORK

Question 18

Suppose a simple discount rate d is equivalent to a simple interest rate r Then the time period t under consideration is given by

[1] $t = \frac{r-d}{dr}$

[2] $t = rd - 1 - r$

[3] $t = rd + 1 - r$

[4] $t = (d-r)dr$

[5] none of the above

Question 19

You must decide if you are going to invest in investment A The profitability index (PI), net present value (NPV) and internal rate of return (IRR) of the investment have been calculated. Which values of the above criteria show investment A to be a positive investment choice?

[1] $PI > 1, NPV > 0$ and $IRR <$ cost of capital

[2] $PI < 1; NPV < 0$ and $IRR <$ cost of capital

[3] $PI > 1, NPV > 0$ and $IRR >$ cost of capital

[4] $PI < 1; NPV < 0$ and $IRR <$ cost of capital

[5] None of the above

Question 20

Gert has started saving towards his retirement in 20 years' time His first payment was R3 600 per year, after which his yearly payments increased by R360 each year If the expected interest rate per year is 10%, the amount that Gert expects to receive, to the nearest rand, on the maturity date will be

[1] R213 030

[2] R340 380

[3] R412 380

[4] R484 380

[5] none of the above

ROUGH WORK

Questions 21 and 22 relate to the following situation:
The following table is an extract from the amortisation schedule for Fred's home loan over a period

Month	*Outstanding principal at beginning of the month*	*Interest due*	*Payment*	*Principal repaid*	*Principal at month end*
196	*R948 004,00*	*R8 690,04*	*A*	*R17 114,67*	*R930 889,33*

Question 21

The applicable interest rate is

[1] 9,26%.
[2] 11,00%.
[3] 11,20%.
[4] 15,08%
[5] none of the above

Question 22

The size of his monthly payment is

[1] R3 878,71
[2] R3 950,00
[3] R8 424,63
[4] R25 804,71
[5] none of the above

Question 23

Levy buys a house and manages to secure a home loan for R950 000 with monthly payments of R10 833,54 at a fixed interest rate of 12,56% per year, compounded monthly, over a period of 20 years If an average inflation rate of 6,8% is expected, then the real cost, to the nearest rand, of the loan is approximately

[1] R469 230
[2] R950 000
[3] R1 180 820
[4] R1 419 230
[5] R1 650 050

ROUGH WORK

Questions 24, 25 and 26 relate to the following situation:
Machteld invests R1 500 000 in her Fern Nursery. Her cash flows for the next five years are expected to be as follows. R610 000, R500 000, R100 000, R800 000 and R750 000. The NPV (net present value) of her investment in Fern Nursery is R345 000.

Question 24

The cost of capital is approximately

[1] 12,5%
[2] 14,12%.
[3] 22,88%
[4] 23,00%
[5] none of the above

Question 25

The profitability index (PI) for the investment in Fern Nursery is

[1] 0,23
[2] 1,23.
[3] 1,50
[4] 1,84.
[5] 2,07

Question 26

If the future value of the cash inflows is R3 433 750, then the MIRR (modified internal rate of return) of the investment in Fern Nursery is

[1] 8,7%
[2] 14,8%.
[3] 18,0%
[4] 23,0%
[5] none of the above

ROUGH WORK

Questions 27 and 28 relate to the following situation:
The equation for the present value of Bond XXX on 11 November 2016 is given by

$$P(11/11/2016) = \frac{10{,}4}{2} a_{\overline{44}|0{,}0875-2} + 100\left(1 + \frac{0{,}0875}{2}\right)^{-44}$$

The fraction of the half year to be discounted back is

$$f = \frac{5}{184}$$

Question 27

The accrued interest for stock XXX is

[1] −R0,07123%
[2] −R0,14247%
[3] R2,55014%
[4] R5,10027%
[5] none of the above

Question 28

The clean price for Bond XXX is

[1] R115,85656%
[2] R115,99903%.
[3] R121,05052%
[4] R121,19145%
[5] R121,19299%

Question 29

The square root of the ... is called the standard deviation The missing word is

[1] coefficient
[2] correlation
[3] coefficient of determination
[4] sample
[5] variance

ROUGH WORK

Question 30

Consider Stock XXX

Coupon rate	10,9% per year
Yield to maturity:	8,7% per year
Settlement date.	12 August 2016
Maturity date.	8 March 2046

The all-in price is

[1] R122,46930%

[2] R123,23691%.

[3] R127,88535%.

[4] R128,68691%.

[5] none of the above

ROUGH WORK

The number of each day of the year

FOR LEAP YEARS, ADD ONE TO THE NUMBER OF EVERY DAY AFTER FEBRUARY 28

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	1	32	60	91	121	152	182	213	244	274	305	335	**1**
2	2	33	61	92	122	153	183	214	245	275	306	336	**2**
3	3	34	62	93	123	154	184	215	246	276	307	337	**3**
4	4	35	63	94	124	155	185	216	247	277	308	338	**4**
5	5	36	64	95	125	156	186	217	248	278	309	339	**5**
6	6	37	65	96	126	157	187	218	249	279	310	340	**6**
7	7	38	66	97	127	158	188	219	250	280	311	341	**7**
8	8	39	67	98	128	159	189	220	251	281	312	342	**8**
9	9	40	68	99	129	160	190	221	252	282	313	343	**9**
10	10	41	69	100	130	161	191	222	253	283	314	344	**10**
11	11	42	70	101	131	162	192	223	254	284	315	345	**11**
12	12	43	71	102	132	163	193	224	255	285	316	346	**12**
13	13	44	72	103	133	164	194	225	256	286	317	347	**13**
14	14	45	73	104	134	165	195	226	257	287	318	348	**14**
15	15	46	74	105	135	166	196	227	258	288	319	349	**15**
16	16	47	75	106	136	167	197	228	259	289	320	350	**16**
17	17	48	76	107	137	168	198	229	260	290	321	351	**17**
18	18	49	77	108	138	169	199	230	261	291	322	352	**18**
19	19	50	78	109	139	170	200	231	262	292	323	353	**19**
20	20	51	79	110	140	171	201	232	263	293	324	354	**20**
21	21	52	80	111	141	172	202	233	264	294	325	355	**21**
22	22	53	81	112	142	173	203	234	265	295	326	356	**22**
23	23	54	82	113	143	174	204	235	266	296	327	357	**23**
24	24	55	83	114	144	175	205	236	267	297	328	358	**24**
25	25	56	84	115	145	176	206	237	268	298	329	359	**25**
26	26	57	85	116	146	177	207	238	269	299	330	360	**26**
27	27	58	86	117	147	178	208	239	270	300	331	361	**27**
28	28	59	87	118	148	179	209	240	271	301	332	362	**28**
29	29		88	119	149	180	210	241	272	302	333	363	**29**
30	30		89	120	150	181	211	242	273	303	334	364	**30**
31	31		90		151		212	243		304		365	**31**

FORMULÆ

$I = Prt$	$r = \frac{d}{1-dt}$
$S = P(1+rt)$	$S = (1+i)Rs_{\overline{n}i}$
$P = S(1-dt)$	$P = (1+i)Ra_{\overline{n}i}$
$S = P\left(1+\frac{j_m}{m}\right)^{tm}$	$P = da_{\overline{n}z} + 100(1+z)^{-n}$
$J_{eff} = 100\left(\left(1+\frac{j_m}{m}\right)^{m}-1\right)$	$\frac{H-R}{365} \times c$
$S = Pe^{ct}$	$\frac{-R}{365} \times c$
$j_\infty = 100(e^c - 1)$	$MIRR = \left(\frac{C}{PV_{\text{out}}}\right)^{\frac{1}{n}} - 1$
$c = m\ln\left(1+\frac{j_m}{m}\right)$	$PI = \frac{NPV + \text{original investment}}{\text{original investment}}$
$j_m = m\left(e^{\frac{c}{m}}-1\right)$	$P = \frac{R}{i}$
$j_n = n\left(\left(1+\frac{j_m}{m}\right)^{\frac{m}{n}}-1\right)$	$S = \left[R+\frac{Q}{i}\right]s_{\overline{n}i} - \frac{nQ}{i}$
$S = R\left(\frac{(1+i)^n-1}{i}\right)$	$T_r = Ra_{\overline{n}r} - P$
$S = Rs_{\overline{n}i}$	$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$
$P = Ra_{\overline{n}i}$	$\bar{x}_w = \frac{\sum_{i=1}^{n} x_i w_i}{\sum_{i=1}^{n} w_i}$
$P = R\left(\frac{(1+i)^n-1}{i(1+i)^n}\right)$	$\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$
$A = nR + Q\left[\frac{n(n-1)}{2}\right]$	$S = \sqrt{\frac{\sum_{i=1}^{n}(x_i-\bar{x})^2}{n-1}}$
	$y = a + bx$

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