UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2014/2015

COURSE NAME	:	MATHEMATICS OF FINANCE
COURSE CODE	:	BWA31603
PROGRAMME	:	3 BWA
EXAMINATION DATE	:	DECEMBER 2014/JANUARY 2015
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **SEVEN (7)** PAGES

Q1 (a) (i) Give the definition of ordinary annuity.

(ii) Starting on 1 June 2015 and continuing until 1 December 2020, a company will need RM250 000 semiannually to retire a series of bonds. Equal semiannual deposits X in a fund paying $j_2 = 10\%$ beginning on 1 June 2010 and continuing until 1 December 2020 are necessary to retire the bonds as they fall due. Calculate the value of X.

(iii) A television set worth RM780 may be purchased by paying RM80 down payment and the balance in monthly installments for 2 years. Find the monthly installment if the dealer charges 15% compounded monthly, and the first installment is due in one month.

(12 marks)

(b) (i) Madam Wong changes employer at age 46. She is given RM8 500 as her vested benefits in the company's pension plan. She invests the money in a registered retirement savings plan paying $j_1 = 8\%$ and leaves it there until her ultimate retirement at age 60. She plans on 25 annual withdrawals from this fund, the first on her 61st birthday. Find the amount of these withdrawals.

(ii) A parcel of land, valued at RM35 000, is sold for RM15 000 down. The buyer agrees to pay the balance with interest at $j_{12} = 12\%$ by paying RM500 monthly for as long as necessary with the first payment due in 2 years from now. Find the number of RM500 payments needed and the amount of the concluding payment one month after the last RM500 payment.

(iii) A certain stock is expected to pay a dividend of RM4.00 at the end of each quarter for an indefinite period in the future. If an investor wishes to realize an annual effective yield of 12%, calculate the amount of money he should pay for the stock.

(13 marks)

Q2 (a) (i) A debt of RM2 000 is to be repaid with quarterly payments over 2 years at $j_{12} = 24\%$. Construct a complete amortization schedule for the borrower.

(ii) A cottage that worth RM42 000 was bought by paying RM7 000 down payment. The balance with interest $j_{12} = 9\%$ in monthly installments of RM600 for as long as necessary. Find the buyer's equity at the end of 5 years.

(13 marks)

(b) (i) A couple buys a condominium on 1 May 2012 for RM65 000. They make a 20% down payment and get a 29-year mortgage loan at $j_{12} = 10\%$ for the balance. The loan is to be amortized by equal monthly payments rounded up to the nearest dime. If they make the first payment on 1 June 2012, calculate the interest that they can deduct when they prepare their income tax return for 2012.

(ii) A borrower has an RM8 000 loan with the Bank *M*. The loan is to be repaid over 4 years at $j_{12} = 18\%$. The contract stipulates a penalty in case of early repayment that equal 3 month's payments. Just after the 20th payment, the borrower determines that the Bank *N* would lend him the money at $j_{12} = 13.5\%$. Make a decision for the borrower.

(iii) A company wants to save RM100 000 over the next 5 years so that they can expand their plant facility. Calculate the deposit at the end of each year if their money earns interest $j_1 = 6\%$.

(12 marks)

Q3 (a) (i) A RM1 000 bond that pays interest at $j_2 = 12\%$ is redeemable at par at the end of 10 years. Calculate the purchase price to yield 10% compounded semiannually.

(ii) A corporation issues a 20-year, RM1 000 bond with coupons at $j_2 = 11\%$. The bond can be called, at par, after 15 years. Calculate the purchase price to yield 13% compounded semiannually.

(iii) A RM1 000 bond, redeemable at par on 1 December 2013, pays semiannual coupons at $j_2 = 9\%$. The bond is bought on 1 June 2011. The purchase price is RM1 022.26. Construct a bond schedule, if the desired yield is 8% compounded semiannually.

(13 marks)

(b) (i) A RM2 000 bond, redeemable at par on 1 October 2013, pays bond interest at $j_2 = 10\%$. Compute the purchase price on 16 June 2011 to yield $j_2 = 9\%$ using the practical method.

(ii) A RM2 000 bond, paying semiannual coupons at 9.5% and redeemable at par on 20 July 2013 is quoted at 96.5% on 20 July 1999. Find an approximate value of the yield rate to maturity j_2 using the Method of Averages.

(12 marks)

Q4 (a) (i) An investor is presented with alternative projects *A* and *B* with the following end-of-year cash flow in **Table Q4**. Each project requires an investment of RM200 000. Decide which project would be chosen if $j_1 = 6\%$.

Table Q4: End-of-year Cash Flow (RM)

Year	1	2	3	4
Project *A*	80 000	70 000	60 000	35 000
Project *B*	30 000	40 000	40 000	150 000

(ii) An investment of RM10 000 returns RM3 000 at the end of years 1 and 2, and RM3 500 at the end of years 3 and 4. Calculate the internal rate of return (IRR).

(12 marks)

(b) (i) Machine *A* costing RM36 000 will last 15 years, and will have salvage value of RM4 800. Its maintenance cost will be RM3 000 a year. Machine *Z* costing RM40 000 will last 20 years, and will have salvage value of RM4 000. Its annual maintenance cost will be RM2 400. If money is worth $j_1 = 11\%$, decide which machine should be purchased.

(ii) A machine costing RM300 000 has an estimated lifetime of 15 years and zero scrap value. At the end of 6 years, the machine becomes obsolete because of the development of a better machine. Calculate the total accumulated depreciation and the book value of the asset at that time, under the straight line method.

(13 marks)

- END OF QUESTION -

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Simple annuities

$$S = Rs_{\overline{n}|i} \equiv R\frac{(1+i)^n - 1}{i} \qquad A = Ra_{\overline{n}|i} \equiv \frac{1-(1+i)^{-n}}{i} \qquad S = Rs_{\overline{n}|i}(1+i)$$

$$A = Ra_{\overline{n}|i}(1+i) \qquad A = Ra_{\overline{n}|i}(1+i)^{-k} \qquad A = \frac{R}{i}$$

Amortization and sinking funds

$$P = A(1+i)^k - Rs_{\overline{k}|i} \qquad P = Ra_{\overline{n-k}|i}$$

Bonds

$$P = Fr\ a_{\overline{n}|i} + C(1+i)^{-n} \qquad P = C + (Fr - Ci)a_{\overline{n}|i}$$

Premium $\equiv P - C = (Fr - Ci)a_{\overline{n}|i}$ Discount $\equiv C - P = (Ci - Fr)a_{\overline{n}|i}$

The theoretical method: $P = P_0(1+i)^k$ The practical method: $P = P_0(1+ki)$

$$P_1 = (1+i)P_0 - Fr \qquad Q = P_0 + k(P_1 - P_0) \qquad I = kFr \qquad P = Q + I$$

Method of averages (Bond Salesman's Method)

$$i \approx \frac{\text{average income per period}}{\text{average amount invested}} = \frac{(nFr + C - P)/n}{(P+C))/2}$$

Capital budgeting

Net present value, NPV = $F_0 + F_1(1+i)^{-1} + F_2(1+i)^{-2} + ... + F_n(1+i)^{-n}$

Internal rate of return

$$F_1(1+i)^{-1} + F_2(1+i)^{-2} + ... + F_n(1+i)^{-n} = F_0 = A \qquad i \simeq \frac{\sum_{t=1}^{n} F_t - A}{\sum_{t=1}^{n} t \cdot F_t}$$

Capitalized cost and capital budgeting

$$K = C + \frac{C-S}{(1+i)^n - 1} + \frac{M}{i} = C + \frac{C-S}{i^*} + \frac{M}{i}$$

Depreciation

$$D_k + B_k = C \qquad R_k = \frac{C-S}{n} \equiv R \text{ (independent of } k)$$

$$D_k = kR = k\left(\frac{C-S}{n}\right) \qquad B_k = C - kR = C - k\left(\frac{C-S}{n}\right)$$

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The Numbr of Each Day of the Year

Day of month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day of month
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

Note: For leap year add 1 day to the tabulated number after February 28.