

CORK INSTITUTE OF TECHNOLOGY
INSTITIÚID TEICNEOLAÍOCHTA CHORCAÍ

Summer 2011 Examination

Module Title: Business Mathematics and Statistics 2

Module Code: STAT 6003

School: Business

Programme Title: Bachelor of Business – Year 1
Bachelor of Business in Business Administration – Year 1
Higher Certificate in Business (EOD) – Year 1

Programme Code: BBUSS_7_Y1
BBADM_7_Y1
BBUSE_6_Y1

External Examiner: Mr. J. Reilly

Internal Examiners: Mr. A. Daly, Mr. C. Daly, Mr. S. O Rourke, Ms. F. Wood

Instructions: Answer *THREE* questions.
Show all calculations **IN FULL**.
Do not write, draw or underline in **RED**.
Write your **class group** and **lecturer's name** on the front page of your answer book

Duration: 2 Hours

Note to Candidates: Please check the Programme Title and the Module Title to ensure that you have received the correct examination paper.

If in doubt, please contact an Invigilator.

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This paper should NOT be attempted by students from class group 1A or by students who are repeating the module

If in doubt, please contact one of the Invigilators.

Q1. (a) The following table shows how the prices of two companies' shares varied in recent years:

<i>Year</i>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>
Company A's share price (€)	3.25	3.58	3.84	4.02	4.38	4.52
Company B's share price (€)	5.48	5.60	5.85	6.15	6.40	6.54

- (i) Calculate a fixed base index of Company A's share price for the years 2004 to 2009, using 2004 as the base year.
- (ii) Calculate a fixed base index of Company B's share price for the years 2004 to 2009, using 2004 as the base year.
- (iii) Which of the two companies would have been the better company to invest in over the period 2004 – 2009? Explain why.

(7 marks)

(b) A fruit wholesaler sells three types of fruit. The following table shows how his prices and sales have varied over the last four years:

<u>Price (€):</u>	<u>Year</u>	<u>Apples</u>	<u>Pears</u>	<u>Oranges</u>
	2007	320	400	480
	2008	350	420	450
	2009	300	450	500
	2010	340	440	470
<u>Quantity Sold:</u> (tonnes)				
	2007	500	400	250
	2008	475	390	300
	2009	520	350	240
	2010	500	370	320

- (i) Calculate a Laspeyres Quantity Index for 2010, with 2008 = 100
- (ii) Calculate a Paasche Price Index for 2009, using 2007 as the base year
- (iii) Calculate a weighted arithmetic mean of price relatives index for 2010 with 2008 = 100, using 2009 expenditure values as weights.

(4 marks)

(4 marks)

(5 marks)

- Q2. (a) (i)** A Lotto winner intends to deposit €125,000 into a savings account. If no withdrawals are made from the account, it will have grown to €170,061 after four years.
Calculate the rate of interest per annum.
- (ii)** A savings account in Bank of Ruritania earns compound interest at 1.25% per month. Calculate the equivalent annual rate of interest.
- (iii)** CITech Ltd. has purchased a new machine for €150,000. The machine will depreciate at a rate of 12.5% per annum. Calculate what its book value will be after 8 years.

(7 marks)

- (b)** Cue Tours Ltd. intends to make four equal deposits into a sinking fund, on January 1st 2012, January 1st 2013, January 1st 2014 and January 1st 2015. The fund will earn compound interest at 10% per annum. If no withdrawals are made from it, there will be €240,000 in the fund on December 31st 2015.

Calculate:

- (i)** the size of each deposit
- (ii)** the total amount of interest that the fund will earn over the four years.
- (c)** On *January 1, 2011* a company borrowed €50,000 from a bank at 4% per annum compound interest. The loan must be repaid to the bank in three equal repayments, due on *December 31* in *2011, 2012* and *2013*.

Calculate:

- (i)** how large each repayment will need to be
- (ii)** the amount that the company will still owe the bank after it has made the second repayment on *December 31, 2012*.

(7 marks)

- Q3. (a)** In a large retail outlet, it has been found that there is a probability of 0.9 that the amount of cash in the tills at the end of any given day will agree with that day's sales.

Find the probability that, if ten days are chosen at random by the manager of the outlet, the amount in the tills will agree with the day's sales on

- (i) six of the ten days
- (ii) at most eight of the ten days.

(6 marks)

- (b)** The length of time that customers have to queue before reaching a cashier has been monitored by the management and is thought to be normally distributed, with a mean of eight minutes and a standard deviation of 1.25 minutes.

Find the percentage of customers that have to queue for

- (i) more than eleven minutes
- (ii) between 6.5 and 7.5 minutes.

(7 marks)

- (c)** An average of five customers come into the retail outlet in any 15-minute period.

Find the probability that the number of customers who enter the outlet between 3.00 p.m. and 3.15 p.m. tomorrow will be between six and eight (*inclusive*).

(7 marks)

Note: $e = 2.7183$ (*approx.*)

- Q4.** As a result of local government cutbacks, some branch libraries are threatened with closure. The head librarian of a certain branch is arguing against the closure of her library and quotes quarterly data for book issues, recorded over the past four years, to support her case. In the following table, the number of books issued by her branch in each quarter is recorded in hundreds:

YEAR	QUARTER			
	I	II	III	IV
2007	32	31	27	30
2008	36	33	28	32
2009	35	34	29	34
2010	37	32	27	35

- (a) Plot the data on a time series graph. (4 marks)
- (b) Calculate a four quarter centred moving average (*trend*) for the data and plot this on the graph you drew in part (a). (7 marks)
- (c) Using a model of your choice, determine seasonal index values (*seasonal variations*) for each of the four quarters. (6 marks)
- (d) (i) Seasonally adjust the number of books issued in each quarter in 2010.
(ii) Has the librarian a strong case against closure? Justify your answer. (3 marks)

Statistical Formulae

Laspeyre's Price Index: $I = \frac{\sum P_n q_0}{\sum P_0 q_0} \times 100$

Paasche Price Index: $I = \frac{\sum P_n q_n}{\sum P_0 q_n} \times 100$

Laspeyre's Quantity Index: $I = \frac{\sum q_n P_0}{\sum q_0 P_0} \times 100$

Paasche Quantity Index: $I = \frac{\sum q_n P_n}{\sum q_0 P_n} \times 100$

Weighted Arithmetic Mean of Price Relatives Index: $I = \frac{\sum \left(\frac{P_n}{P_0} \times w \right)}{\sum w} \times 100$

Compound Interest: $A = P(1+i)^n$

Present Value: $P = A(1+i)^{-n} \left[= \frac{A}{(1+i)^n} \right]$

A = Amount

P = Present Value

Depreciation: $B = C(1-i)^n$

Annuity Formulae: (Payment Interval = Interest Period)

A = Amount
P = Present Value

$$A = R \left[\frac{(1+i)^n - 1}{i} \right]$$

$$P = R \left[\frac{1 - (1+i)^{-n}}{i} \right]$$

Binomial Distribution: $P(r, n) = {}^n C_r p^r q^{n-r}$

Poisson Distribution: $P(x) = \frac{\lambda^x \cdot e^{-\lambda}}{x!}$ $\lambda = np$

Standard Units: $Z = \frac{x - \bar{x}}{\sigma}$

