NATIONAL UNIVERSITY OF SINGAPORE

School of Computing

BT1101 – INTRODUCTION TO BUSINESS ANALYTICS

(Semester 1: AY2015/16)

Time Allowed : 2 Hours

INSTRUCTIONS TO STUDENTS

1. Please write your Student Number only. Do not write your name.
2. This assessment paper contains **TWO (2)** sections and comprises **FOURTEEN (14)** printed pages, including this page. Section 1 contains **TWENTY (20)** multiple choice questions (each question is worth 1 mark). Section 2 contains **TEN (10)** structured questions (each question is worth 2 marks).
3. Use the provided **OCR Form** for **Section 1**.
4. Answer **ALL** questions within the space in this booklet for **Section 2**.
5. This is a **CLOSED BOOK** assessment.

STUDENT NO: _____

This portion is for examiner's use only

Question	Marks	Remarks
Section 1		
Section 2		
Total		

Section 2: Short Answer Questions (10 × 2 Mark = 20 Marks)

Q21. Suppose that you are interested in testing whether a patient's symptoms improve after treatment A more rapidly than after a placebo treatment. Your null hypothesis is as following: "A patient's symptoms after treatment A are indistinguishable from a placebo." Discuss four possible outcomes and discuss when Type I and Type II errors occur.

Q22. Suppose you are interested in how well the combined earnings of the parents in a child's family predicts high school graduation. You are told that the probability a child graduates from high school is 27% for children whose parents earn no income and is 88% for children whose parents earn $60,000. Determine the logistic regression model that is consistent with this information.

[Q23-Q24] Suppose you are interested in comparing the means of salary for three groups.

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Group1	15	651028	43401.86667	1.03E+08
Group2	15	713014	47534.26667	2.26E+08
Group3	15	814158	54277.2	1.66E+08

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	9.04E+08	2	452041887	2.740003	0.076122	3.219942
Within Groups	6.93E+09	42	164978608.1			
Total	7.83E+09	44				

Q23. Write down your null and alternative hypotheses to compare the means of salary across the three groups by applying ANOVA.

Q24. Based on the following results, test your null hypothesis in Q23 and interpret the results. Use alpha = 0.05.

Q25. Briefly explain classification as a data mining tool. Specifically, discuss the concept of classification technique with an example algorithm and then provide a real-world application.

Q26. How does supervised learning (e.g., classification) differ from unsupervised learning (e.g., clustering and association rules)?

[Questions 27-30] Clementi Office Equipment produces two types of desks, standard and deluxe. Deluxe desks have oak tops and more-expensive hardware and require additional time for finishing and polishing. Standard desks require 70 board feet of pine and 10 hours of labor, whereas deluxe desks require 60 board feet of pine, 18 square feet of oak, and 15 hours of labor. For the next week, the company has 5,000 board feet of pine, 750 square feet of oak, and 400 hours of labor available. Standard desks net a profit of $225, and deluxe desks net a profit of $320. All desks can be sold to national chains such as Staples or Office Depot.

Q27. Mathematically formulate a linear optimization model. That is, outline your objective function and all the constraints in the form of equality/inequality.

Q28. Suppose you obtained the following solutions and the sensitivity report output.

	Standard	Deluxe
Number Produced	40.00	0.00
Optimized Total Profit	$9,000	

Variable Cells

Cell	Name	Final Value	Reduced Cost	Objective Coefficient	Allowable Increase	Allowable Decrease
B11	Number Produced Standard	40	0	225	1E+30	11.66666667
C11	Number Produced Deluxe	0	-17.5	320	17.5	1E+30

Constraints

Cell	Name	Final Value	Shadow Price	Constraint R.H. Side	Allowable Increase	Allowable Decrease
D14	Pine Used	2800	0	5000	1E+30	2200
D15	Oak Used	0	0	750	1E+30	750
D16	Labor Used	400	22.5	400	314.2857143	400

Explain the reduced cost associated with deluxe desks.

Q29. Based on the sensitivity report given in Question 28, the shop supervisor is suggesting that the workforce be allowed to work an additional 50 hours at an overtime premium of $18/hour. Is this a good suggestion? Justify your conclusion.

Q30. Based on the sensitivity report given in Question 28, if the unit profit of standard desks is only $210, how will the optimal solution and total profit be affected?

End of Paper