UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2014/2015

COURSE NAME	:	STATISTICS FOR DECISION MAKING
COURSE CODE	:	BWB 21503
PROGRAMME	:	2 BWQ
EXAMINATION DATE	:	JUNE 2015/JULY 2015
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

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

Q1 (a) Define the term Heuristics and give two examples of Heuristics problem.
(3 marks)

(b) When making decisions using heuristics approaches, the most common biases are availability, adjustment and anchoring, representativeness and mental model. Explain the term availability.
(3 marks)

(c) **Figure Q1(c)** show certain process in manufacturing industry. Develop a simple heuritic approach to determine the shortest path to travel from **S** to **G** by passing through all the available nodes.
(5 marks)

(d) Mr. Dominic has two years working experiences and a degree in law. When an employee at Brian Law Firm was asked to estimate the starting salary, he guessed RM32000 per annum. Based on biasness, justify your answer.

(4 marks)

Q2 (a) Define what is descriptive, nomative and prescriptive models of analysis.
(3 marks)

(b) Rational decision making processes consist of a sequence of steps designed rationally to develop a desired solution. Give the typicallysteps in rational decision making and explain the steps.
(6 marks)

(c) Rational Choice Theory requires us to assign probabilities and numerical values to all possible outcomes and choose the action with the highest expected value. Consider the following problem, should you buy alone 24-pack of pepsi in cans for RM8 or four 6-pack of pepsi in bottles for RM5 each?
(6 marks)

Q3 (a) Statistical Decision Making are used to make decisions about some condition in the real world. One of the tools is the hypothesis where it can be used to decide if a facility is in compliance.Explain the Type I error and Type II error.

(8 marks)

(b) Suppose that we want to predict student rank, Excellent-1, Moderate-2 and Bad-3, based on statistical aptitude test scores and test scores from personality test that measures conscientiousness as shown in **Table Q3(b).**

Table Q3(b): Student Rank

Student Rank	Statistical Aptitude	Test Score
1	56	25
3	45	19
1	38	30
3	49	38
2	48	28
3	55	30
3	53	29

Predict the rankwhen Statistical Aptitude is 87 and Test Score is 12.

(7 marks)

Q4 (a) Define Bayesian probability theorem and two complement properties.

(4 marks)

(b) A engineer wanted to know the state of the machine in an assembly line and selected a component randomly. The probability that adefective component is found is 45%. If a defective component was found, the probability that Machine 3 breaks down an hour after the inspection is 0.56 Onthe other hand, if a non-defective component was found, the probability that Machine3 breaks down an hour after the inspection is just 0.35. Find the probability that Machine 3 breaks down an hour after the inspection.

(7 marks)

(c) Suppose there is a test for HIV. Let say B be the event that the person has diabetes and A be the event that the test is positive. If we desire that $P[B|A]$ =0.78 and $P[B]$ =0.04. What should $P[A|B]$ =$P[\bar{A}|\bar{B}]$ be to achieve this.

(4 marks)

Q5 (a) Consider a decision problem with two states with the prior probabilities $P(S_1)$=0.63 and $P(S_2)$=0.37 and two acts, where payoff are given in **Table Q5(a)**.

Table Q5(a): Payoff for Two States

	Act	
	A_1	A_2
S_1	80	20
S_2	-64	11

Using maximum expected value rule, calculate the $E[V(A_1)]$ and $E[V(A_2)]$
(4 marks)

(b) Using data from part (a), suppose we have a matrix of reliability probabilities is given in **Table Q5(b)**.

Table Q5(b): Matrix of Reliability Probabilities

	P(Z|S)	
	Z_1	Z_2
S_1	0.62	0.38
S_2	0.27	0.6

(i) Calculate the posterior probabilities $P(S|Z)$.

(ii) If the decision maker receives the signal Z_1, what should we replace the prior probabilities $P(S_1)$ and $P(S_2)$?

(iii) If the decision maker receives the signal Z_2, what should we replace the prior probabilities $P(S_1)$ and $P(S_2)$?

(iv) Calculate the conditional expected value $E[V(a)|Z]$ and decide the optimal for each signal.
(12 marks)

Q6 Consider two examples of real-life operationon heart failure. The **Table Q6** below shows the success rates and two ways of operations involving both normal and severe heart problem, *Operation A* and *Operation B*. The numbers in parentheses indicate the number of success cases over the total size of the group.

Table Q6: Success Rate of Treatments

	Operation A	***Operation B***
Normal	*Group 1* **87% (76/87)**	*Group 2***90% (243/270)**
Severe	*Group 3* **69% (182/263)**	*Group 4***71% (57/80)**
Both	**74% (258/350)**	**86% (300/350)**

The paradoxical conclusion is that *Operation B* is more effective when used on normal heart failure, and also when used on severe heart failure, yet *Operation A* is more effective when considering both sizes at the same time. This is a Simpson's paradox. Which treatment is considered better?

(12 marks)

Q7 Alexia is a film director and just finished produsing a new film entitled "Fast and Furious Parit Raja Paradoxia". Company AA and Company BB both wants an exclusive right to produce his film. If he signs a deal with Company AA, he will receive a single lump sum, but if he signs a deal with Company BB,the amount that he will receive depends on the market response to his movie. Which company that he should choose as payoff is given in **Table Q7**?

Table Q7: Alexia's Payoff

	State of Nature		
DECISIONS	Small Box Office	Medium Box Office	Large Box Office
Sign with Company AA	RM1,500,099.05	RM3,000,499.05	RM7,010,099.05
Sign with Company BB	RM1,111,111.55	RM1,111,111.55	RM1,111,111.55
Prior Probabilities	0.4	0.5	0.1

(a) Using expected return criteria, what would be her best decision?

(b) Using the decision tree, would her decision be the same as in (i)?

(12 marks)

- END OF QUESTION –

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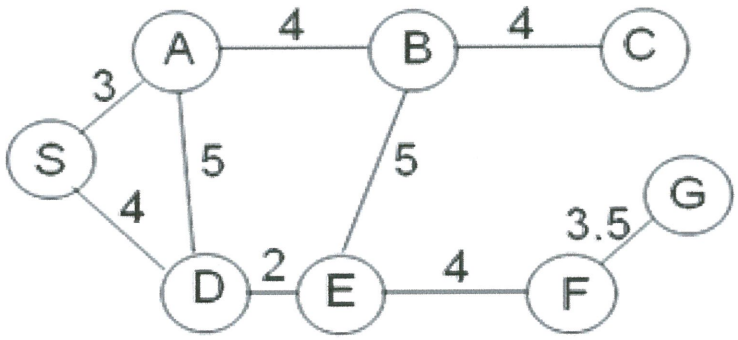

FIGURE Q1(c): An Instance of the Travelling Salesman Problem