BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF COMMERCE

DEPARTMENT OF ECONOMICS

MSc ECONOMICS

ADVANCED MICROECONOMICS (MEC 501)

EXAMINATION   **DURATION: 3 HOURS**

INSTRUCTIONS TO CANDIDATES

1. **Answer any four (4) questions**
2. **The paper carries six questions**
3. **All questions carry equal marks of 25 each**
4. **The use of cellphones is not allowed in the exam**

Question 1

Mr Carr derives a lot of pleasure from driving under the wide blue skies. For the number of kilometres, x, that he drives, he receives utility $U(x) = 500x - x^2$. (Once he drives beyond a certain number of kilometres, weariness kicks in and the ride becomes less and less enjoyable.) Now his car gives him a decent highway 255 kilometres to the litre of petrol. But paying for petrol, represented by y, induces disutility for Mr Carr, shown by $U(y) = -1,000y$. Mr Carr is willing to spend up to $25 for leisurely driving every week.

(a) Find the optimum number of kilometres driven by Mr Carr every week given that the price of petrol is $2.50 per litre. **(7 marks)**

(b) How does the value in (a) change when the price of petrol rises to $5 per litre?

(7 marks)

(c) Now, further assume that there is a probability of 0.001 that Mr Carr will get a flat tyre every kilometre that he drives. The disutility from a flat tyre is given by $U(z) = -50,000z$ (where z is the number of flat tyres incurred), and each flat tyre costs $50 to replace. Find the distance driven that maximizes Mr Carr's utility after taking into account the expected likelihood of flat tyres (assume that the price of petrol is $2.5 per litre). **(11 marks)**

[25 marks]

Question 3

Mrs Jones has made an apple pie for her son, Elmer, and she is trying to figure out whether the pie tasted divine or merely good. Her pie turns out divinely a third of the times. Elmer might be ravenous, or merely hungry, and he will eat either 2, 3, or 4 pieces. Mrs Jones knows that he is ravenous half the time (but not which half). If the pie is divine, then if Elmer is hungry, the probabilities of the three consumptions are (0, 0.6, 0.4), but if he is ravenous the probabilities are (0, 0, 1). If the pie is just good, then the probabilities are (0.2, 0.4, 0.4) if he is hungry and (0.1, 0.3, 0.6) if he is ravenous. Elmer is a sensitive, but useless, boy. He will always say that the pie is divine and his appetite weak, regardless of his inner feelings.

(a) Determine the probability that he will eat four pieces of pie. **(11 marks)**

(b) If Mrs Jones sees Elmer eat four pieces of pie, what is the probability that he is ravenous and the pie is merely good? **(7 marks)**

(c) If Mrs Jones sees Elmer eat four pieces of pie, what is the probability that he is ravenous and the pie is divine? **(7 marks)**

[25 marks]

Question 4

Consider the following extended prisoner's dilemma game:

		Prisoner 2		
		Confess	Don't confess	Run away
Prisoner 1	Confess	-5, -5	0, -6	-5, -10
	Don't confess	-6, 0	-1, -1	0, -10
	Run away	-10, -6	-10, 0	-10, 0

(a) Determine whether Prisoner 1 has a strictly dominated strategies **(5 marks)**

(b) Determine the weakly dominated strategies in this game. **(5 marks)**

(c) By using iterated elimination of weakly dominated strategies, solve the Nash equilibrium of this game. **(8 marks)**

(d) Explain whether Prisoner 1's choice of strategy depends on whether Prisoner 2 is rational or not. **(7 marks)**

[25 marks]

Question 5

Intel and Advanced Micro Devices (AMD) are the only firms that produce central processing units (CPUs), which are the brains of personal computers. Both because the products differ physically and because of Intel's Inside advertising campaign has convinced some consumers of its superiority, customers view the CPUs as imperfect substitutes. Consequently, the two firms' inverse demand functions differ as follows:

$p_A = 197 - 15.1 \, q_A - 0.3 \, q_I$

$p_I = 490 - 10\,q_I - 6\,q_A,$

where price is dollars per CPU, quantity is in millions of CPUs, the subscript I indicates Intel, and the subscript A represents AMD. Each firm faces a constant marginal cost of, $MC = \$40$, and there are no fixed costs. The firms compete as Cournot duopolists.

(a) Determine each firm's best response function. **(9 marks)**

(b) Solve for the Nash-Cournot equilibrium quantities. **(8 marks)**

(c) Determine each firm's profits. **(8 marks)**

[25 marks]

Question 6

Consider Julia who consumes two goods, X_1 and $X_2,$ according to the following Cobb-Douglas utility function:

$$U(X_1, X_2) = X_1^{\alpha} X_2^{1-\alpha}$$

Given that $0 < \alpha < 1$

If the price of X_1 is P_1 and the price of X_2 is P_2 and Julia has a total income of M:

(a) Determine Julia's optimal consumption bundle in terms of her income and prices of the two goods. **(7 marks)**

(b) What share of her income does she spend on X_1. ? **(5 marks)**

(c) Derive her expenditure function. **(5 marks)**

(d) Derive the compensated demand functions of X_1 and X_2. **(8 marks)**

[25 marks]

END OF PAPER