

| COLLEGE | College of Business \& Economics |
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| SCHOOL | Economics |
| CAMPUS | APK |
| MODULE NAME | Microeconomics 4 |
| MODULE CODE | MIE 8X01 |
| SEMESTER | First |
| ASSESSMENT OPPORTUNITY | APS Assessment |
| MONTH \& YEAR | July 2019 |


| ASSESSMENT DATE | July 2019 | SESSION | 1 |
| :--- | :--- | :--- | :--- |
| INTERNAL ASSESSOR | Prof G Van Zyl |  |  |
| INTERNAL ASSESSOR | Prof E Kleynhans (NWU) |  |  |
| DURATION | 3 hours | TOTAL MARKS | 100 |

## INFORMATION/INSTRUCTIONS

There are three questions with sub-sections
The paper has 6 numbered pages.
Each question needs to be completed in a different colour-coding assessment script.
A noiseless calculator is allowed.
Employment and income multiplier tables \& t-tables will supplied in the venue.
1.1 Queens and Edgars are the two market leaders in the men's apparel market in Johannesburg. For the past two financial years, Queens is the leading firm (based on market share). The main selling activities of the two firms are men's shirts (short sleeves \& long sleeves) and trousers (casual trousers \& formal trousers). Analysts are of the opinion that the following payoff structure is possible:

| Strategies | Pay-off |
| :--- | :--- |
| Both Queens and Edgars chooses shirts (S) at the <br> same time. | Queens 0\% growth \& Edgars 0\% growth. |
| Both Queens and Edgars chooses trousers (T) at the <br> same time. | Queens 0\% growth \& Edgars 0\% growth. |
| Queens expand shirts production and at the same time <br> Edgars expands its trousers production line. | Queens 7\% growth \& Edgars 4\% growth. |
| Queens expand trousers production and at the same <br> time Edgars expands its shirt production line. | Queens 5\% growth \& Edgars 3\% growth. |

Assume the following possible strategies that Edgars can adopt.

| Strategy |
| :--- |
| Edgars always follow the production activities of Queens. |
| Edgars always chooses the opposite production strategy of Queens. |
| Edgars always choose to produces shirts (S). |
| Edgars always choose to produce trousers (T). |

State the conditional format of the strategies (in tabular format), plot the sequential payoff matrix (in tabular format), determine the formal Nash equilibria and determine the sub-game perfect equilibrium (illustrate with the aid of a diagram).
1.2 Assume that the competition for certain product lines between these two firms is so strong that it is a zero gain situation. Queens has decided to concentrate its activities on the selling of short sleeves \& long sleeves shirts while Edgars has decided to concentrate its activities on the selling of casual \& formal trousers. Queens preferred option is long sleeves shirts while Edgars' preference is to expand its casual trousers product line. The payoff matrix is as follow:

|  |  |  | Edgars |  |
| :--- | :--- | :--- | :--- | :--- |
|  |  | Casual trousers |  | Formal trousers |
|  | Long sleeves | +R18m/-R18m |  | +R10m/-R10m |
| Queens |  |  |  |  |
|  | Short sleeves | +R16m/-R16m |  | +R14m/-R14m |

Determine the Nash equilibrium probabilities of Queens opting for long sleeves shirts (Is) and Edgars opting for casual trousers (ct).

What would the success rates be for the companies at Nash equilibrium?
1.3 The management of Queens must determine whether to expand its long sleeves product line or to expand its short sleeves product line. From market studies management constructed the following payoff matrix of the present value of all future net profits under different time frames:

Long sleeves shirts
Short sleeves shirts

| Time frame | Probability | Profit | Probability | Profit |
| :--- | :--- | :--- | :--- | :--- |
| 1 year | 0.4 | R 14 m | 0.2 | R 16 m |
| 2 years | 0.3 | R 16 m | 0.4 | R 18 m |
| 3 years | 0.3 | R 18 m | 0.4 | R 20 m |

The manager's utility for the money function is:
$U=5 M-0.02 M^{2}$ (Where $M$ refers to rand).

1) Is the managerial team risk seeking, risk neutral or a risk averse?
2) If the managerial teams' objective was profit maximisation regardless of risk, which sales activity should it introduce?
3) If the managerial teams' objective was utility maximisation, which sales activity should it introduce?
4) Assume i) that the present value cost outlay of long sleeves shirts is R18m ii) the discount rate is $14 \%$ and the certainty-equivalent coefficient is 0.50 . Use the valuation model to indicate whether Queens should continue with its long sleeves product line expansion program (explain your answer).
5) Assume that the present value cost outlay of the extension of the short sleeves product line activity is R6m. Use the maximin and minimax regret criteria to determine whether Queens should proceed with its sales expansion program.
1.4 Queens is requesting you to perform a microeconomic impact study (specifically on indirect and combined income generating and job creation aspects) on its expansion of its long sleeves product line. Assume the following information. (See the attached multiplier tables).

- The present values per product/service category

| Product/service <br> Category | PV of forecasted sales |
| :--- | :---: |
| Long sleeves shirts | R14 000000 |

Compile a brief report for management.
2.1 Market research clearly indicates that the consumer demand for long sleeve shirts is determined by the own average prices of the different fashion ranges for shirts \& trousers, the competitor average price index, the amount spend on advertising, the density of men's fashion outlets in the area \& the monthly disposable income of households in the particular area where Queens is situated.

Assume an estimated demand function for the long sleeves product line of Queens. A sample period of 16 quarters is used (2016:1-2019:4). The following table contains i) the parameter estimates ii) the standard errors and iii) the $\mathrm{R}^{2}$.

## Demand function

R2: 0.88

| Variable | Estimate | Standard error |
| :---: | :---: | :---: |
| Intercept | 33.42 | 3.05 |
| Paverage pirce long sleeves | -3.55 | 1.10 |
|  | -9.11 | 2.65 |
| Paverage pirce casual trusers | -9.35 | 2.90 |
| Paverage price formal trousers | -7.26 | 2.46 |
| Paverage pirce index of other competitors | 4.82 | 1.59 |
| Marketing expenses | 3.62 | 2.22 |
| Density of men's fashion outlets in Johannesburg | -1.17 | 0.08 |
| Monthly disposable income of households in Johannesburg | 4.72 | 1.08 |

(Paverage pice long sleeves; $; P_{\text {average p pice shorts sleveses }} ; \mathrm{P}_{\text {average }}$ pice casual trousers ; $\mathrm{P}_{\text {average p pice formal trousers }}$ are expressed in hundreds of rand, ii) marketing expenses are expressed in thousands of rand, the average prices of competitor firms are expressed in an price index (a lower price index would relate to lower average prices and vice versa) the density of men's fashion outlets is expressed as a density index (the more men's fashion outlets in Johannesburg the greater the index) and the disposable income of households in thousands of rand. Consensus forecasts for the different variables for 2019:1 are listed in the following table.

Assume the consensus forecasts for the different variables for 2019:1.

| Variable | 2019:1 |
| :---: | :---: |
| Paverage price long sleves | R600 |
| $\mathrm{P}_{\text {average pice }}$ pice shor sleeves | R450 |
| Paverage price casual trusers | R550 |
| $\mathrm{P}_{\text {average }}$ price formal tousers | R800 |
| Paverage pirce index of other competiors | 0.55 |
| Marketing expenses | R30 000 |
| Density of men's fashion outlets | 0.45 |
| Disposable income of households in a particular area | R28 518 |

- Are the estimates of the variables statistically significant?
- Use the forecasted values of the first quarter and determine the elasticity coefficients of the demand function. How would you explain the degree of sensitivity of each elasticity coefficient?
- Assume the following scenario for quarter 2. The average price of long sleeves shirts increases with $1 \%$ and the average price of short sleeves increases to R455; the average prices of both casual and formal trousers are estimated to increase with $1 \frac{1}{2} \%$; marketing expenses is expected to increase to R32 000; the average price index of competitors is expected to increase to 0.59 ; the density index of men's fashion outlets is expected to increase to 0.47 ; due to lower inflation and a decrease in personal tax rates disposable income of households is expected to increase to R26 980. Estimate sales of Queens for the $2^{\text {nd }}$ quarter of 2019.
- Assume that the aim of Queens is to maximise its revenue position on long sleeve shirts. What should the price of long sleeves shirts be in quarter 1 ?
2.2 Edgars needs advice on the setting of a profit-optimal price for its formal trousers. The current average market price is R800 per trouser. The marginal cost is R50 per trouser. The estimated quarterly demand for its product is:

$$
Q=500+100 P^{M}-10 P Q
$$

(where $P^{M}=$ average price per formal trouser in the market and $P^{E}=$ average price per formal trouser that Edgars charges)
(The average market price $\left(\mathrm{P}_{\mathrm{M}}\right)$ is expressed in hundreds of rand and the final $\mathrm{P}^{\mathrm{E}}$ should be interpreted in tens of rand)
2.3 Edgars has estimated a multiplicative demand function for its casual trousers product line.
(where $Q_{p}=$ quantity, $P_{0}=$ own price, $\mathrm{P}_{\text {comp }}=$ average price of competitors, $\mathrm{A}=$ advertising expenses, $\mathrm{P}_{\text {FORMAL TROUSERS }}=$ average price of FORMAL TROUSERS, Inc = disposable income of households and Paverage shirts)

Advice Edgars on the interpretation of estimated function.
2.4 Assume the following estimated trend forecast equation for formal trousers sold by Edgars.

$$
Q_{G B}=10.04(1.02)^{t}
$$

The sample period for the estimated function was 2013:1 - 2018:4. Do a trend forecast for the four quarters of 2019. In order to cater for any seasonal variation dummy variables were introduced for each quarter. The estimated function after the introduction of these dummy variables is:

$$
S_{T}=24.25-0.55 D_{1 T}-0.48 D_{2 T}-0.45 D_{3 T}+0.02 D_{4 T}+0.03 t
$$

(where $D_{1 T}$ is the dummy variable for the $1^{\text {st }}$ quarter, $D_{2 T}$ is the dummy variable for the $2^{\text {nd }}$ quarter, $D_{3 T}$ is the dummy variable for the $3^{\text {rd }}$ quarter and $D_{4 T}$ is the dummy variable for the $4^{\text {th }}$ quarter)

Adjust the trend forecast for seasonal variation.
3.1 In terms of the Cobb-Douglas, proof that $\mathrm{E}_{K}$ and $\mathrm{E}_{\mathrm{L}}$ are the output elasticities of K and L .
3.2 Queens is concerned about the returns to scale, optimality of its input mix and its cost efficiency. A CobbDouglas estimation as well as cost estimations were estimated for a twenty-quarter period. The following estimation results apply:

Dependent variable: $\log \mathrm{Q}$
$\mathrm{R}^{2}: 0.78$

| Variable | Estimate | Standard error |
| :--- | :--- | :--- |
| Intercept | -2.7 | 0.26 |
| Log K | 0.42 | 0.03 |
| Log L | 0.29 | 0.03 |

Variance-covariance matrix

|  | Intercept | LogK | LogL |
| :---: | :--- | :--- | :--- |
| Intercept | 0.030 | -0.002 | 0.009 |
| Log K | -0.002 | 0.0025 | -0.001 |
| Log L | 0.005 | -0.001 | 0.0009 |

The average values for output and input usage (all in hundreds of units) are:

| $Q$ | 14 |
| :--- | :--- |
| $K$ | 78 |
| $L$ | 0.52 |
| r (price of capital) | 0.26 |
| w (price of labour) | 62 |

Dependent variable: $\log (T C / r) \quad$ R2: 0.82

| Variable | Parameter estimate | Standard error |
| :--- | :--- | :--- |
| Intercept | -0.43 | 0.03 |
| LogQ | 1.29 | 0.07 |
| Log $(w / r)$ | 1.28 | 0.29 |

You have to advice Queens on i) the statistical significance of the estimates ii) the returns to scale position iii) the optimality of the input mix and iv) the long-run cost efficiency.
3.3 Edgars has a capacity constraint in its trouser section. Individual store space allocated to the combined sales of formal trousers (FT) and casual trousers (CT) cannot exceed $15 \mathrm{~m}^{2}$. Assume that the estimated profit function for the soft golf equipment section per store is:

$$
\Pi=70 \mathrm{FT}-4 \mathrm{FT}^{2}-(\mathrm{FT})(\mathrm{CT})-6 \mathrm{CT}^{2}+86 \mathrm{CT}
$$

Apply the Lagrangian multiplier in order to determine the impact on the profits of trousers per store if store space increases by $1 \mathrm{~m}^{2}$.

