KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2014/2015

FIRST SEMESTER EXAMINATIONS FOR THE DEGREE OF BACHELOR OF ECONOMICS

EES 100 : MATHEMATICS FOR ECONOMISTS I

DATE: Monday 8th December 2014

TIME: 11.00 A.M. – 1.00 P.M.

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INSTRUCTIONS

ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS

**Question one**

1. Simplify the following expression so that all the components are positive:

(i) $\left(2^{3}x^{-4}y^{5}\right)^{-2}$ (ii) $\frac{2x^{4}\left(x^{2}y\right)^{o}}{\left(4x^{-2}y\right)^{2}}$ (3marks)

1. Expand the following: $\left(x+y\right)^{6}$ (3marks)
2. A manufacturer of showerheads has a revenue function of R(x)= 81.50x and cost function C(x)=63x+1850. Find the number of units that must be sold to generate normal profits of break – even. (2marks)
3. Suppose the profits received from the production and sales of x units (x≥0) of a product is given by ∏(x) = -0.4$x^{2}$ +40x -360 . Find the maximum profit and the corresponding output level (3marks)
4. Find $lim\frac{2x-1}{x+2}$ as $x\rightarrow \infty $ if it exists (3marks)
5. If $f(x)$= $\frac{x^{3}-3x^{2}+2}{x^{2}-4}$ , find $f^{'}(x)$ or $\frac{df}{dx}$ (4marks)
6. Represent in form of a set all positive integers (name it set I). What is the name of the method you used? (3marks)
7. If the total cost function for a product is $C(x)$ = $\left(x+5\right)^{3 }$, where $x$ represents the number of hundreds of units produced, producing how many units will minimize average cost? Find the minimum average cost. (5marks)
8. Find the point of inflection of the graph of $y=\frac{1}{2}x^{4}-x^{3}$+5 . Prove that it is actually a point of inflexion. (4marks)

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**Question two**

1. Records at a small college show the following about the enrollments of 100 freshmen in Mathematics, Fine Arts and Economics. 38 take math, 42 take fine arts, 20 take economics, 4 take economics and fine arts, 15 take economics and math , 9 take math and fine arts while 3 take all three subjects.

Required:

1. How many take none of the three courses? (2marks)
2. How many take math or economics? (2marks)
3. How many take exactly one of these three courses? (2marks)
4. An electric utility company determines the monthly bill for a residential customer by adding an energy charge of 8.38 cents per kilo watt hour (kwh) to its base charge of $4.95 per month. Write an equation for the monthly charge (y)n in terms of the number of kwh (x) that are used. (2marks)
5. The supply function for a product is given by $p=q^{2}+300$ , and the demand function is given by $+q=410$ . If p& q represent price and quantity respectively (4marks)
6. Simplify the following: (i) $2^{log\_{2}4}$ (ii) $log\_{3}\left(\frac{9}{27}\right)$ (4marks)
7. Evaluate the following : $\lim\_{x\to \infty }\left(1+\frac{1}{x}\right)^{x}$ (2marks)
8. Highlight any two benefits of studying mathematical economics (2marks)

**Question three**

1. The weekly demand function for a product sold by only one firm is $p=600-\frac{1}{2}x$ and the average cost of production and sale is $=300+200x$ .

Required:

1. Derive equations for revenue, profit and cost (4marks)
2. Find the quantity that will maximize profits (4marks)
3. Find the price at this optimal level of production (2marks)
4. What is the maximum profit (2marks)
5. Suppose the demand per commodity is 24 if the price is $16, 20 if the price is $18, 16 if the price is $20 and 12 if the price is $22. Assuming a linear relationship, derive the demand function (4marks)
6. Find $\frac{dy}{dx} $ if $y=\left(x+3\right)\left(x^{2}-2x\right)$ (3marks)
7. What is a Venn diagram? (1mark)

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**Question four**

1. The demand function is given as $p+4q=80$.
2. Find the point elasticity of demand at P=10 (4marks)
3. What type of elasticity is this? Unit, elastic or inelastic. Why? (2marks)
4. How will a price increase affect total revenue? (2marks)
5. Solve the following quadratic equations:
6. $x^{2}+7x+6=0$ (ii) $2x^{2}+5x+8=0$ Hint:$\frac{-b\pm \sqrt{b^{2}-4ac}}{2a}$ comment on the state and type of roots emerging (4marks)
7. Solve the following for x: (i) $ln\left(e^{x^{2}+3x}\right)=3x+4$ (ii)$log\_{b}b^{x^{2}+3x}=8$ (4marks)
8. The total cost of a firm is given by the following function $TC=Q^{3}-5Q^{2}+100Q$ . Determine the level of Q at which TC is minimized. Confirm that the second order condition is satisfied. (4marks)

**Question five**

1. If the demand and supply functions are given by $p=600-q$ and $p=200+\frac{1}{3}q$ respectively, find the tax rate that will minimize the total tax revenue T. (6marks)
2. Find the derivative of the following function : $y=\left(17+x^{2}+3x^{4}\right)^{8}$ (4marks)
3. Consider the following production with labor (L) as the only input: $=49L^{\frac{2}{7}}$ . Compute marginal productivity of labor (MPL) and then use second order derivative to determine whether the function obeys the law of diminishing return (4marks)
4. Given that consumption function is as follows : $C=120+0.75Y$ where C is consumption and Y is income , determine saving function and then compute marginal propensity to consume and save (6marks)

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