UGANDA MARTYRS UNIVERSITY

FACULTY OF SCIENCE

DEPARTMENT OF MATHEMATICS AND STATISTICS

UNIVERSITY EXAMINATIONS SEMESTER 1

2015/2016

First Year [BAM and IT]

FOM 1011: Fundamentals of Mathematics/Elements of Mathematics

Date : 9^{th} December, 2015

Time : 3 Hours (2:00 - 5:00PM)

Instructions

1. Read and follow instructions on the answer booklet
2. *Do not write any thing on this question paper:*
3. Attempt any **Five** (5) questions.

Question 1

(a) List any four inequalities [4 marks]

(b) Write inequalities for the following

(i) Numbers between -1 and 4 inclusive [1 mark]

(ii) Numbers less than or equal to 6 [1 mark]

(c) Solve and graph the inequalities on a numberline

(i) $4(x + \frac{1}{2}) - 2(x + \frac{3}{2}) \leq 5$ [3 marks]

(ii) $|6 - x| < 7$ [3 marks]

(d) The area of a parking lot is 800 square meters. A car requires 8 square meters. A bus requires 50 square meters. The attendant can handle only 80 vehicles. If a car is charged \$3 and a bus \$4, how many of each should be accepted to maximize income? [8 marks]

Question 2

a(i) Define a surd.

[2 marks]

(ii) Show that the product of $a\sqrt{b}+c\sqrt{d}$ and $a\sqrt{b}-c\sqrt{d}$ is always rational if a, b,c and d are rational.

[4 marks]

(iii) simplify the expression

$2\sqrt{27}+3\sqrt{75}-\sqrt{300}$

[2 marks]

(b) Rationalise the denominator of the following

(i) $\frac{5}{3-\sqrt{5}}$

[2 marks]

(ii) $\frac{3\sqrt{3}-2}{2+3\sqrt{3}}$

[2 marks]

(c) solve for x

$3\sqrt{x}=\sqrt{(x+8)}$

[3 marks]

Question 3

(a) Solve the following system.

$2x-y=5$

$3x+y=10$

[4 marks]

(b) On the same axes draw lines

$x+y=2$

$3x-y=2$

Hence state the solution of the linear system.

[6 marks]

(c) The sum of Peter and Anneka's ages is 34, and the difference between their ages is 8. Find their ages given that Peter is older than Anneka.

[3 marks]

d(i) Jean is 7 years older than half of Tom's age. If Jean is 35, how old is Tom? [4 marks]

(ii) The sum of two consecutive even numbers is 46. Find the numbers. [3 marks]

Question 4

(a) Factorize the following expressions.

(i) $m^2 - 12m + 36$ [2 marks]

(ii) $3x^2 + 16x + 5$ [2 marks]

(b) Factorise and simplify

$\frac{x^2+3x+2}{3x+6}$ [2 maks]

(c) solve

$3x^2 - 10x - 8 = 0$ [4 marks]

(d) A company determines that the cost C(x) of manufacturing x units of a commodity may be approximated by $C(x) = 100 + \frac{10}{x} + \frac{x^2}{200}$. How many units should be produced in order to minimize the cost?

[4 marks]

(e) An electronic company estimates that the cost (in dollars) of producing x components used in electronic toys is given by $C(x) = 200 + 0.05x + 0.0001x^2$

Find

(i) the cost, the average cost and the marginal cost of producing 1000 units. [6 marks]

Question 5

(a) If $f(x) = x^2$ and $g(x) = 2x - 3$, find:

(i) $f(-3)$ [2 marks]

(ii) $f \circ g(x)$ [3 marks]

(iii) $g^{-1}(x)$ [3marks]

(b) Find the value of x for which f(x) below is meanmgless

$f(x) = \frac{2x+3}{4x^2-9}$ [2 marks]

c(i) State the gradient and y-intercept of the line $y = -\frac{1}{3}x - 4$ [2 marks]

(ii) Find the equation of the straightline passing through(3,1) and perpendicular to $y = 3x - 7$ [3 marks]

(d) Find the derivatives of the following functions

(i) $f(x) = 2x^4 - \frac{1}{2}x^2 + \frac{1}{x^2} + 2$ [3 marks]

(ii) $y = 4x^2 + 3x^{-} - 10$ [2 marks]

Question 6

(a) Use the rules of indices to simplify each of the following and where possible evaluate

(i) $\frac{15x^6y^2}{3y^3 \cdot 5x^1}$ [3 marks]

(ii) $\frac{3^5 6^{-2}}{2^1 3^1}$ [2 marks]

(b) Solve the following equations

(i) $log_3(\frac{1}{27}) = x$ [2marks]

(ii) $4c^x = 100$ [2 marks]

c(i) What is a logarithm? [1 mark]

(ii) State any four laws of logarithms [4 marks]

d(i) Solve

$ln(x - 4) + Inx = In21$ [4 marks]

(ii) Evaluate the expression

$log_3 100 - log_3 18 - log_3 50$ [2 marks]

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