MACHAKOS UNIVERSITY

University Examinations 2016/2017

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

FIRST YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF BACHELOR OF AGRIBUSINESS AND AGRICULTURE EDUCATION.

SUPPLEMENTARY/SPECIAL EXAMINATION

KCU 101: FUNDAMENTALS OF MATHEMATICS

DATE: **TIME:**

INSTRUCTIONS

Attempt Question 1 And Any Other 2 Questions.

QUESTION ONE (30 MARKS)

a) Determine $\frac{5x^4+3x^3+2x-1}{x-3}$ (5 marks)

b) Calculate the mean and standard deviation from the following numbers: 34.61, 34.57, 34.40, 34.63, 34.63, 34.51, 34.49, 34.61, 34.52, 34.55, 34.58, 34.53, 34.44, 34.48 and 34.40 (6 marks)

c) Transpose the formula $\frac{p}{q} = \sqrt{\frac{a+2b}{a-2b}}$ to make b the subject of the formula. (5 marks)

d) Determine the solutions of the simultaneous equations $y = x^2 + x + 1, y = 4 - x$. (4 marks)

e) Find the gradient of the curve $y = 2t^4+3t^3 - t + 4$ at the point$(0,4)$. (4 marks)

f) The probability of a component failing in one year due to excessive temperature is $\frac{1}{20}$, due to excessive vibration is $\frac{1}{25}$ and due to excessive humidity is $\frac{1}{50}$. Determine the probabilities that during a one-year period a component:

(i) fails due to excessive vibration
(ii) fails due to excessive vibration or excessive humidity, and
(iii) will not fail because of both excessive temperature and excessive humidity.

(6 marks)

QUESTION TWO (20 MARKS)

a) Use the factor theorem to factorize $x^3 + 4x^2 + x - 6$ and hence solve the cubic equation $x^3 + 4x^2 + x - 6 = 0$. (8 marks)

b) If **A=i+3j+2k**, **B=2i+5j-k**, **C=i+2j+3k**, find $(A \times B) \times C$ (6 marks)

c) Solve the following systems by the Gauss-Jordan method: $x_1 + x_2 + 2x_3 = 8;\ -x_1 - 2x_2 + 3x_3 = 1; 3x_1 - 7x_2 + 4x_3 = 10.$ (6 marks)

QUESTION THREE (20 MARKS)

a) Resolve $\frac{18+21x-x^2}{(x-5)(x+2)^2}$ into partial fractions. (7 marks)

b) Find the inverse of the matrix $\begin{pmatrix} 3 & 4 & -1 \\ 1 & 0 & 3 \\ 2 & 5 & -4 \end{pmatrix}$. (7marks)

c) Plot a graph of $y = 3e^{0.2x}$over the range x= −3 to x =3. Hence determine the value of y when x =1.4 and the value of x when y = 4.5 (6 marks)

QUESTION FOUR (20 MARKS)

a) A rectangular building is 15m long by 11m wide. A concrete path of constant width is laid all the way around the building. If the area of the path is 60.0m^2, calculate its width correct to the nearest millimetre. (6 marks)

b) Solve the indicial equation $4^{2x-1} = 5^{x+2}$ (7 marks)

c) Given that $f(x) = \frac{1+x}{1-x}, find\ f(x,y) = \frac{f(x)-f(y)}{1+f(x)f(y)}. Hence\ find\ (-2,3).$ (7 marks)

QUESTION FIVE (20 marks)

a) The number of faults occurring on a production line in a nine-week period are as shown below. Determine the median and quartile values for the data : 30 27 25 24 27 37 31 27 35 (8 marks)

b) Solve the inequality $|5-3t| > 4$ (6 marks)

c) Evaluate $\int_1^3 (x^2 - 4x + 3)\, dx$. (6 marks)