MURANG'A UNIVERSITY COLLEGE

A constituent college of Jomo Kenyatta University of Agriculture and Technology

University Examination 2015/2016

END OF SEMESTER I EXAMINATION FOR THE DIPLOMA OF SCIENCE IN ENGINEERING–YEAR 3

SEE 1301: ENGINEERING MATHEMATICS V

DATE: 7TH December 2015 **TIME: 2 HOURS**

Instructions: Attempt question **One** and any other **Two** questions

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Question One (30 Marks)

1. a) Find the determinant of the following matrix (6mks)

$$\begin{pmatrix} 1 & 4 & -3 \\ -5 & 2 & 6 \\ -1 & -4 & 2 \end{pmatrix}$$

(b) Use cramer's rule to solve the simultaneous equations (6 mks)

$2x + y = 7$

$3x - 4y = 5$

(c) Find the Eigen values Eigen vectors of the matrix (6 mks)

$A = \begin{bmatrix} 1 & 2 \\ 2 & 4 \end{bmatrix}$

(d) Each time a certain horse runs in a three horse race, he has probability ½ of winning, ¼ of coming in second and ¼ of coming third, independent of the outcome of any previous race. Prepare transition matrix of the above case (6mks)

(e) Let $G(s) = s(s^2 + 4s + 5)^{-1}$ find the inverse transform of G(s) (6 mks)

Question two (20 marks)

(a) Use Laplace transforms to solve the following initial value problems

$Y^{11} + 10y^{1} + 9y = f(t)$, $y(0) = 1$, $y'(0) = 2$ (10 mks)

(b) Find the Eigen values and associated Eigen vectors of the matrix

$A = \begin{pmatrix} 1 & 2 \\ 3 & 2 \end{pmatrix}$

Question three (20 marks)

(a) Compute the inverse transform of the following function (10 mks)

$F(s) = (s^2 + 4s)^{-1}$

(b) Express $\frac{7x+10}{2x^2+5x+3}$ in terms of partial fractions (10 mks)

Question four (20 marks)

(a) Find the determinant of the matrix (10 mks)

$$A = \begin{pmatrix} 4 & 81 & 63 & 0 & 3 \\ 13 & 15 & 55 & 3 & 93 \\ 0 & 0 & 2 & 0 & 0 \\ 0 & 10 & 29 & 0 & 0 \\ 6 & 12 & 213 & 0 & 5 \end{pmatrix}$$

(b) Solve

$2xy\frac{dy}{dx} - y^2 + x^2 = 0$ (10 mks)

Question five (20 marks)

(a) Find the determinant of the following matrices.

$$A = \begin{pmatrix} 2 & 1 & 3 & 2 \\ 3 & 0 & 1 & -2 \\ 1 & -1 & 4 & 3 \\ 2 & 2 & -1 & 1 \end{pmatrix}$$ (5 mks)

$$B = \begin{pmatrix} 1 & 0 & 1 & 1 & 2 \\ 2 & 1 & -2 & 1 & 2 \\ 5 & 4 & 0 & -2 & 1 \\ 1 & -1 & 0 & 0 & 2 \\ 0 & 1 & 2 & -1 & -1 \end{pmatrix}$$ (5 mks)

(b) Solve the second order initial value problem

$\frac{d^2y}{dt^2} + 2\frac{dy}{dt} + 2y = e^{-t}$ $y(0) = 0$ $y'(0) = 0$ (10 mks)