MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)
University Examinations for 2015/2016 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCE

DEPARTMENT OF MATHEMATICS AND STATISTICS

SECOND SEMESTER EXAMINATION FOR DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

SMA 210: MATHEMATICS IV

Date: 19/04/2016 **Time: 2.00-4.00 PM**

INSTRUCTIONS

Attempt Question One Which is A Compulsory Question And Any Other Two Questions.

Show All Your Working.

1. a) Given that A = $\begin{bmatrix} 1 & 2 & 0 \\ 2 & 1 & 1 \\ 1 & 2 & 4 \end{bmatrix}$ and B = $\begin{bmatrix} -1 & 1 & 3 \\ 2 & 2 & 1 \\ 1 & 0 & 2 \end{bmatrix}$ (5 marks)

Determine AB – A.

b) Solve the equation $\begin{vmatrix} X & 2 & 3 \\ 2 & 3 & X \\ X & 1 & 2 \end{vmatrix}$ = -4 (5 marks)

c) Solve the following differential equations

i) $\frac{dy}{dx} = 3 + 2y$ (4 marks)

ii) $\frac{dy}{dx} = 5x + sinx$ (4 marks)

d) Use Maclaurins series to obtain series of

(i) Sin x as far as the term in x^5 then simplify your answer. (6 marks)

(ii) $(2 + 3x)^4$ then simplify your answer. (8 marks)

2. a) Given that A = $\begin{bmatrix} 4 & 9 \\ -3 & 6 \\ 2 & 5 \end{bmatrix}$ B = $\begin{bmatrix} -3 & 2 & 4 \\ 4 & 5 & 2 \end{bmatrix}$ and C = $\begin{bmatrix} X & -4 & Y \\ -4 & 5 & -3 \\ 2 & -3 & Z \end{bmatrix}$

and that (AB)C = $\begin{bmatrix} -120 & 67 & 15 \\ -63 & -12 & -24 \\ -66 & 35 & 7 \end{bmatrix}$ Determine the values of X, Y and Z.

(8 marks)

b) Use Crammers rule to solve the equations

3p – q – r = 3

2p + 3q- r = -1

P + 4q – 5r = 8 (12 marks)

3. a) Solve the differential equation $2\frac{dr}{dx} + sin2x = 0$ given that when x = $\frac{\pi}{2}$ r = 2 (6 marks)

b) Solve the differential equation $(D^2 – D – 2)\ y = 6e^{-x}$ given that when x = 0, y = 3

$\frac{dy}{dx} = -2.$ (14 marks)

4. a) Express cos(x+h)) as a series of powers of h and evaluate, without using tables, $Cos70^0$ by using Taylors series correct to 4 decimal places given that $cos60^0 = \frac{1}{2}$ and $sin60^0 = \frac{\sqrt{3}}{2}$. (10 marks)

b) Solve the differential equation $xy\frac{dy}{dx} = x^2 + y^2$ given that when x = 1 y = 0. (10 marks)

5 a) Find from first principals the Laplace transform of e^{2t}. (4 marks)

b) Determine the inverse Laplase transform of $\frac{4s^2 - 5s + 6}{(s+1)(s^2+4)}$ (6 marks)

c) Use Laplace transforms to solve the differential equation

$\frac{d^2x}{dt^2} - 3\frac{dx}{dt} + 2x = 2e^{3t}$ given that at t = 0, x = 5 and $\frac{dx}{dt} = 7$ (10 marks)