MACHAKOS UNIVERSITY COLLEGE

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

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

SECOND SEMESTER EXAMINATION FOR
DIPLOMA IN EDUCATION SCIENCE
DIPLOMA IN CIVIL ENGINEERING

SMA 0202: ORDINARY DIFFERENCE EQUATIONS

Date: 1/8/2016 **Time: 2:00 – 4:00 PM**

INSTRUCTIONS:

Answer Question one and any other two questions

QUESTION ONE (COMPULSORY)

a) Write the order and degree of each of the following differential equations. (4 marks)

i. $\frac{d^2y}{dx^2} + \frac{dy}{dx} = 3xe^t$

ii. $\frac{d^3y}{dx^3} + \frac{dy}{dx} = \sin x$

b) Show that the functions beside the ordinary differential equation are solution. (5 marks)
$\frac{d^2y}{dx^2} + y = o, y = \cos x$

c) Solve the differential equation given by (5 marks)
$\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = 0$

d) Find the particular solution of (5 marks)
$\frac{d^2y}{dx^2} - 3\frac{dy}{dx} - 2y = e^{-3x}$

QUESTIONTWO (20 MARKS)

a) The population of Kwale in 2002 and 2008 were 12 and 18 thousands respectively. Find the year that the population of Kwale was $5\frac{1}{3}$ thousand given that the rate of growth of population is directly proportional to the population. (10 marks)

b) Solve the differential equation defined by
$\frac{d^2y}{dx^2} + 6\frac{dy}{dx} + 13y = 0$ (10 marks)

QUESTION THREE (20 MARKS)

a) A substance cools from $100°C$ to $60°C$ in 10 seconds. Find the temperature of the room after 40 seconds assuming that the room temperature is $20°C$ (14 marks)

b) Define the particular solution of
$\frac{d^2y}{dx^2} + 4y = \cos 3x$ (6 marks)

QUESTION FOUR (20 MARKS)

a) Find the particular solution (5 marks)
$\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = e^x\,(x+1)$

b) Solve the following differential equation

$\frac{d^2y}{dx^2} - \frac{dy}{dx} + 2y = 4x^2$ (15 marks)