



MACHAKOS UNIVERSITY

University Examinations 2018/2019

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS, STATISTICS AND ACTUARIAL SCIENCE

SPECIAL/SUPPLEMENTARY EXAMINATION FOR

DIPLOMA IN ELECTRICAL ENGINEERING

DIPLOMA IN MECHANICAL ENGINEERING

DIPLOMA IN CIVIL ENGINEERING

ECU 0301: MATHEMATICS VII

DATE 23/7/2019

TIME: 8:30 – 10:30 AM

INSTRUCTIONS

ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS

QUESTION ONE (30 MARKS)

Solve the following differential equations

a) $x \frac{dy}{dx} = 3 - 2x^2$ (3 marks)

b) $y \frac{dy}{dx} = 3 - y^2$ (5 marks)

c) $2 \frac{dr}{d\theta} + \sin 2\theta = 0$ (5 marks)

d) $\frac{dy}{dx} + x = y$ given $x = 0$ when $y = 2$ (7 marks)

e) $(x + 2) \frac{dy}{dx} = 3 - \frac{2y}{x}$ (5 marks)

f) $\frac{d^2y}{dx^2} + 6 \frac{dy}{dx} + 13y = 0$ (10 marks)

QUESTION TWO (20 MARKS)

- a) Solve the following Bernoulli differential equation

$$\frac{dy}{dx} + x^{-1}y = x^{-1}y^2 \quad (6 \text{ marks})$$

- b) Solve the linear differential equation

$$x^2 \frac{dy}{dx} + 2xy - x + 1 = 0 \quad (4 \text{ marks})$$

- c) Use the method of undetermined coefficient to solve the differential equation

$$\frac{d^2y}{dx^2} + 14 \frac{dy}{dx} + 49y = 4e^{5x} \quad (10 \text{ marks})$$

QUESTION THREE (20 MARKS)

- a) Obtain the particular solution of the differential equation

$$x \frac{dy}{dx} = y + x^3 - 2x \text{ given that } x = 1 \text{ when } y = 3 \quad (5 \text{ marks})$$

- b) Solve the differential equations

$$\text{i) } xy \frac{dy}{dx} = x^2 + y^2 \quad (5 \text{ marks})$$

$$\text{ii) } 3 \frac{d^2y}{dx^2} + \frac{dy}{dx} - 4y = 2e^{-3x} \quad (10 \text{ marks})$$

QUESTION FOUR (20 MARKS)

- a) Solve the equation

$$\frac{d^2y}{dx^2} - 2 \frac{dy}{dx} + 3y = x^2 - 1 \quad (8 \text{ marks})$$

$$\text{b) } \frac{d^2y}{dx^2} + 6 \frac{dy}{dx} + 10y = 2\sin 4x \quad (7 \text{ marks})$$

$$\text{c) } 2(x+1) \frac{dy}{dx} (1-2x)y = x^2 \sqrt{1-x} \quad (5 \text{ marks})$$

QUESTION FIVE (20mks)

$$\text{a) } (x+2) \frac{dy}{dx} = 3 - \frac{2y}{x} \quad (6 \text{ marks})$$

$$\text{b) } x^3 \frac{dy}{dx} - x^2y = y^4 \cos x \quad (4 \text{ marks})$$

$$\text{c) } \frac{d^2y}{dx^2} - 4 \frac{dy}{dx} + 4y = 4x + 3\cos 2x \quad (10 \text{ marks})$$

