



MACHAKOS UNIVERSITY

University Examinations 2017/2018

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

SECOND YEAR SECOND SEMESTER EXAMINATIONS FOR

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

DIPLOMA IN BUILDING AND CIVIL ENGINEERING

DIPLOMA IN MECHANICAL ENGINEERING

MATHEMATICS VI

DATE: 18/12/2017

TIME: 2.00-4.00 PM

INSTRUCTIONS

Answer Question One and Any Other Two Questions

QUESTION ONE

- a) Find the maclaurin's series for the functions
- $\sin^2 x$ (2 marks)
 - $\ln(1 + 3x)$ (2 marks)
- b) Obtain the taylor's series for the functions
- $f(x) = \cos 2x$ (2 marks)
 - $f(x) = \sin x$ (2 marks)
- c) Define interpolation and extrapolation (5 marks)
- d) Derive the Newton Raphsons interpolation formula (5 marks)
- e) Given $x_1 = 3$ is an approximation to the $\sqrt{10}$ use iteration to find a better approximation to the root (5 marks)
- f) Determine the taylor's series of the function
- $$f(x) = e^{\sin x}$$

Hence evaluate the value of $\int_{0.1}^{0.5} e^{\sin x} dx$ (7 marks)

QUESTION TWO

- a) Given that x_n is an approximation to the root of the equation $4x^3 - 6x^2 + 15x + 4 = 0$ show that using Newton Raphsons method a better approximation x_{n+1} is given by

$$x_{n+1} = \frac{8x_n^3 - 6x_n^2 + 4}{12x_n^2 - 12x_n + 15} \text{ hence taking the first approximation } x_0 = 0.7$$

find to 6 decimal places the root of the equation (10 marks)

Table 1 satisfies a function $f(x)$

X	-4	-2	0	2	4	6	8
f(x)	-44	6	8	10	60	206	496

Using Gregory – Newton interpolation formulae determine the values of

- $f(-3.7)$
- $f(6.5)$ (10 marks)

QUESTION THREE

- a) Given the function $x^3 + 2x^2 - 5x - 1$ show that a better approximation to the root is given by $x_{n+1} = \frac{2x^3 + 2x^2 + 1}{3x^2 + 4x - 5}$ hence using $x_0 = 1.4$ find a better approximation to the root of the equation (10 marks)

- b) Using the table below

x	1	2	3	4	5	6	7
F(x)	-3	1	11	33	73	137	231

- Construct a table of differences
- Use the table to obtain $f(2.8)$ and $f(6.7)$ (10 marks)

QUESTION FOUR

- a) Given that $\cos 60^\circ = 0.5$ determine the value of $\cos 70^\circ$ by taylor's series (5 marks)

- b) Determine the value of $\int_0^1 \frac{\cos 2x}{x^3} dx$ (5 marks)

- c) Determine the value of $f(x)$ at $x = 5.5$ given the table below

x	2	4	6	8	10
F(x)	14	88	274	620	1174

(10 marks)