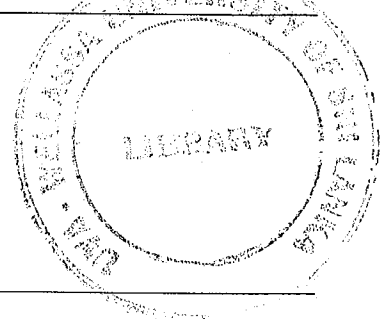


Uva Wellassa University of Sri Lanka
 Faculty of Science and Technology
 Department of Science and Technology
 300 Level 1st Semester Examination – June/July 2017
 MRT 305-3 Mathematical & Statistical Methods in Mineral Science



Instructions to candidates

Duration: Three(03) hours

Number of questions: Six(06) Essay Questions

Mark allocation: 120 mark

Use standard symbols without definition.

Scientific calculators are allowed.

Answer all questions

1.

a. A root of the equation $x^3 + 3x^2 - 3 = 0$ lies between -3 and -2. Find this root, with an accuracy 10^{-3} , by **interval bisection method**. (10 mark)

b. Use the **Jacobi's method** to solve the following system;

$$2x + 2y + z = 1$$

$$x + 3y + z = 1$$

$$x + 2y + 2z = 7$$

where $x^{(0)} = -0.98, y^{(0)} = -0.98$ and $z^{(0)} = 4.97$. (10 mark)

2.

a. Determine the **Lagrange's interpolating polynomial** of degree 3, which fits the following data and hence find an approximate value of $y(10)$. (10 mark)

x	-2	-1	2	3
y	-12	-8	3	5

b. Compute the **Newton's divided difference** table for the following points, hence find $f(x)$ as a polynomial. (10 mark)

x	0	1	2
$f(x)$	2	1	0

3.

a. Use most appropriate **three point formulas** to determine the approximate values of $\frac{dy}{dx}$ for $x = 1.0, 1.4$ and 2.2 from the following data. (Take $h = 0.2$) (10 mark)

x	y
1.0	2.7183
1.2	3.3201
1.4	4.0552
1.6	4.9530
1.8	6.0496
2.0	7.3891
2.2	9.0250

b. Evaluate

$$I = \int_0^1 \frac{1}{1+x^2} dx$$

using mid-point rule and trapezoidal rule.

(10 mark)

4. Calculate $y(0.1)$, using Runge-Kutta second order method,

$$\frac{dy}{dx} = 1 + y - x$$

given that $y = 1$ at $x = 0$.

(20 mark)

5. Use Euler's method to find a numerical approximation for $y(t)$ where

$$\frac{dy}{dx} = 1 + xy ; y(0) = 1$$

from $x=0$ to $x = 1$ using step size $h = 0.2$.

(20 mark)

6.

a. What is Geostatistics?

(04 mark)

b. What are the geological features which account for anisotropy?

(04 mark)

c. Define and briefly discuss the followings.

i. Random Variable

(03 mark)

ii. Kriging

(03 mark)

iii. Stationarity

(03 mark)

iv. Spatial continuity

(03 mark)