MONAD UNIVERSITY HAPUR (UP)

Programme: M.Sc.

Semester: III

Course: MMTH-211 Complex Analysis

Assignment No: 1

Due date of submission: 11.09.2017

Instructions:

1. Write the responses to the assignment in your own handwriting.
2. Submit the responses to your HOD within the due date.
3. Write your Name, Program me, and Enrolment No. clearly at the top of the page.

Q.1

(a) Evaluate the integral $\oint_C \frac{1}{z-z_0} dz$, where C is a circle centered at z_0 and of any radius. The path is traced out once in the anticlockwise direction.

(b) Find the residue at the following function:

$$\frac{e^z-1}{z^5}$$

Q2.

(a) As you are aware of the bilinear transformation, show that the map of the straight line x = y is a circle under the transformation $w = \frac{z-1}{z+1}$. Find its center and radius.

(b) What is the relation between conformal mappings and holomorphic functions?

MONAD UNIVERSITY HAPUR (UP)

Programme: **M.Sc**

Semester: **III**

Course: **MMTH-212 Differential Geometry**

Assignment No: **1**

Due date of submission: **11.09.2017**

Instructions

1. Write the responses to the assignment in your own handwriting.
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Q.1

a) Find the length of the curve given as the intersection of the surfaces $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$, $x=\cosh\left(\frac{z}{a}\right)$ from the point $(a,0,0)$ to the point (x,y,z).

b) Show that the tangent at any point of the curve, whose equations are $x=3u$, $y=3u^2$ and $z=2u^3$ makes a constant angle with the line $y=z-x=0$.

Q.2

a) For the curve $x=3t$, $y=3t^2$ and $z=2t^3$, show that any plane meets three points and deduce the equation to the osculating plane at $t=t_1$.

b) Find the osculating plane at point 'u' on the helix $x=a\cos u$. $y=a\sin u$ and $z=cu$.

MONAD UNIVERSITY HAPUR (UP)

Programme: M.Sc.

Semester: III

Course: MMTH-213 Mathematical Methods

Assignment No: 1

Due date of submission: 11.09.2017

Instructions:

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Q.1

(a) As you are aware of Fourier series, suppose F=f (a, b) with two continuous derivatives. Show that whenever x and x + h belong to (a, b), one may write $F(x + h) = F(x) + hF_0(x) + h^2/2\, F''(x) + h^2 \varphi(h)$, where $\varphi(h) \to 0$ as $h \to 0$. Deduce that $F(x + h) + F(x - h) - 2F(x)\, h^2 \to F''(x)$ as $h \to 0$.

(b) Find the Fourier series for (periodic extension of) $f(t) = \frac{1}{2} t$, $t \in [0, 2)$; -1, $t \in [2, 4)$. Determine the sum of this series.

Q2.

(a) As you are aware of boundary value problems, solve the following BVP:

$$y' + 4y = 0, \qquad y(0) = -2, \quad y\left(\frac{\pi}{4}\right) = 10\,.$$

(b) Solve the following one-dimensional wave problem:

$9\, u_{xx} = u_{tt}$, $0 < x < 5$, $t > 0$

$u(0,t) = 0$ and $u(5,t) = 0$, $u(x, 0) = 4\sin(\pi x) - \sin(2\pi x) - 3\sin(5\pi x)$, $u_t(x, 0) = 0$.

MONAD UNIVERSITY HAPUR (UP)

Programme: **M.Sc.**

Semester: **III**

Course: - **MMTH-214 Functional Analysis**

Assignment No: **1**

Due date of submission: **11.09.2017**

Instructions

1. Write the responses to the assignment in your own handwriting.
2. Submit the responses to your HOD within the due date.
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Q.1

(a) The linear space R^n equipped with the norm given by

$$\| x \|_2 = \left(\sum_{i=1}^{n} | \xi_i |^2 \right)^{\frac{1}{2}}, \qquad x = (\xi_1, \xi_2, ..., \xi_n) \in R^n \text{ is a real Banach space.}$$

(b) Define Quotient space of normed linear spaces.

Q.2

(a) State Uniform boundedness theorem.

(b) Define Open mapping theorem.

MONAD UNIVERSITY HAPUR (UP)

Programme: **M.Sc.**

Semester: **III**

Course: **MMTH-215 Bio Mathematics**

Assignment No: **1**

Due date of submission: **01.09.2017**

Instructions

1. Write the responses to the assignment in your own handwriting.
2. Submit the responses to your HOD within the due date.
3. Write your Name, Programme and Enrolment Number clearly at the top of the page.

Q.1

(a) Consider the following set of non-linear differential equations:

$$\frac{dx}{dt} = x - xy$$

$$\frac{dy}{dt} = -y + xy$$

Find the critical points of the system. Discuss the type and stability of the critical points.

(b) Discuss logistic growth model.

Q.2

(a) Discuss continuous time dependent age-structured population model.

(b) Write down the Lotka-Volterra predator-prey model. Discuss the type and stability of equilibrium points.