GURU JAMBHESHWAR UNIVERSITY OF SCIENCE & TECHNOLOGY, HISAR
DIRECTORATE OF DISTANCE EDUCATION

Programme: M.Sc. (Mathematics) **Semester: I**
Paper Code: MAL-511 **Total Marks = 15**
Nomenclature of Paper: Algebra (Assignment-I)

Important Instructions

(i) Attempt all three questions from the assignment given below. Each question carries 5 marks and the total marks are 15.
(ii) All questions are to be attempted in legible handwriting on plane white A-4 size paper and to be submitted to the Directorate of Distance Education for evaluation either in person or through Speed Post.

Q 1**.** State and prove Jordan Holder Theorem for finite groups.

Q 2. If a and b are algebraic over F, then show that

$[F(a,b):F] = [F(a,b),\ F(a)][F(a),F]$. Show it by an example also.

Q 3. If a and b are elements of a group for which $a^3 = (ab)^3 = (ab^{-1})^{3^2} = e$, then show that $[a,b,b] = e$.

Programme: M.Sc. (Mathematics) **Semester: I**
Paper Code: MAL-511 **Total Marks = 15**
Nomenclature of Paper: Algebra (Assignment-II)

Important Instructions

(i) Attempt all three questions from the assignment given below. Each question carries 5 marks and the total marks are 15.
(ii) All questions are to be attempted in legible handwriting on plane white A-4 size paper and to be submitted to the Directorate of Distance Education for evaluation either in person or through Speed Post.

Q 1. If G is nilpotent, then show that the elements of coprime orders commutes in G.

Q 2. Prove that e^3 is transcendental number.

Q 3. Prove that every cyclotomic polynomial is irreducible over the field of rational numbers.

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DIRECTORATE OF DISTANCE EDUCATION

Programme: M.Sc. (Mathematics) **Semester: I**

Paper Code: MAL-512 **Total Marks = 15**

Nomenclature of Paper: Real Analysis (Assignment-I)

Important Instructions

(i) Attempt all three questions from the assignment given below. Each question carries 5 marks and the total marks are 15.

(ii) All questions are to be attempted in legible handwriting on plane white A-4 size paper and to be submitted to the Directorate of Distance Education for evaluation either in person or through Speed Post.

Q.1. Show that if $< f_n(x) >$ and $< g_n(x) >$ converges uniformly on a set E, then $< f_n(x) + g_n(x) >$ converges uniformly a set E. What about $< f_n(x) \, , g_n(x) >$? Prove or disprove.

(2.5 + 2.5 = 5)

Q.2. State and prove Weierstrass M-test and show that $\int_0^1 \left(\sum_{n=1}^{\infty} \frac{x^n}{n^2}\right) dx = \sum_{n=1}^{\infty} \frac{1}{n^2(n+1)}$.

(2.5 + 2.5 = 5)

Q.3. Show that x = 0 is point of non-uniform convergence of the series.

(5×1 = 5)

$$\sum_{n=1}^{\infty} \frac{-2x(1+x)^{n-1}}{[1+(1+x)^{n-1}][1+(1+x)^n]}$$

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DIRECTORATE OF DISTANCE EDUCATION

Programme: M.Sc. (Mathematics) **Semester: I**

Paper Code: MAL-512 **Total Marks = 15**

Nomenclature of Paper: Real Analysis (Assignment-II)

Important Instructions

(i) Attempt all three questions from the assignment given below. Each question carries 5 marks and the total marks are 15.

(ii) All questions are to be attempted in legible handwriting on plane white A-4 size paper and to be submitted to the Directorate of Distance Education for evaluation either in person or through Speed Post.

Q.1. Prove that outer measure of an interval is its lengh. (5)

Q.2 Suppose $f \in R(\alpha)$ on [a, b], $m \leq f \leq M$ on [a, b],ϕ is continuous on [m, M] and $h(x) = \phi(f(x))$ for $x \in [a, b]$, then $h \in R(\alpha)$ on [a, b], (5)

Q.3. Explain the geometrical interpretation of Riemann-Stieltjes Integral. (5)

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Programme: M.Sc. (Mathematics) **Semester: I**

Paper Code: MAL- 513 **Total Marks = 15**

Nomenclature of Paper: MECHANICS (Assignment-I)

Important Instructions

(iii) Attempt all three questions from the assignment given below. Each question carries 5 marks and the total marks are 15.

(iv) All questions are to be attempted in legible handwriting on plane white A-4 size paper and to be submitted to the Directorate of Distance Education for evaluation either in person or through Speed Post.

1. State and prove parallel axis theorem for moment of inertia.
2. Find the equimomental system for a parallelogram.
3. Derive Lagrange's equations and Hamilton's equations of motion for a particle in central force field (planetary motion).

Programme: M.Sc. (Mathematics) **Semester: I**

Paper Code: MAL- 513 **Total Marks = 15**

Nomenclature of Paper: MECHANICS (Assignment-II)

Important Instructions

(i) Attempt all three questions from the assignment given below. Each question carries 5 marks and the total marks are 15.

(ii) All questions are to be attempted in legible handwriting on plane white A-4 size paper and to be submitted to the Directorate of Distance Education for evaluation either in person or through Speed Post.

1. State and prove Jacobi-Poisson theorem.
2. A particle of mass *m* moves in a force whose potential in spherical coordinates V is $-\mu\cos\theta/r^2$. Write Hamilton in spherical coordinate (r,θ,ϕ). Also find solution of Hamilton- Jacobi equation.
3. Show that a family of right circular cones with a common axis and vertex is a possible family of equipotential surfaces and find the potential function.

Ordinary Differential Equations-I (MAL-514) Assignment: I

M.Sc. Mathematics (Sem. I) Max. Marks: 15

Note: Attempt all questions. Each question carries 5 marks.

Q.1 Verify that the given diff. eqn. yz dx – zx dy - y^2 dz = 0, is integrable and find out its primitive. 5

Q.2 State and prove Cauchy Peano Existence Theorem. 5

Q.3 State and prove the basic theorem concerning the dependence of solution of differential equation $\frac{dy}{dx} = f(x, y)$, on the initial conditions. 5

Ordinary Differential Equations-I (MAL-514) Assignment: II

M.Sc. Mathematics (Sem. I) Max. Marks: 15

Note: Attempt all questions. Each question carries 5 marks.

Q.1 Solve the Riccati Equation $\frac{dy}{dx} = (1-x)y^2 + (2x-1)y - x$. 5

Q. 2 State and Prove Sturm Separation Theorem. 5

Q. 3 Find the characteristic values and characteristic functions of the Sturm-Liouville Problem

$\frac{d}{dx}[(x^2+1)\frac{dy}{dx}] + \frac{\lambda}{x^2+1}y = 0$ where , y(0) = 0 and y(1) = 0 . 5

ASSIGNMENT -1

GURU JAMBHESHWAR UNIVERSITY OF SCIENCE & TECHNOLOGY, HISAR

DIRECTORATE OF DISTANCE EDUCATION

Programme: M.Sc. (Mathematics) **Semester: I**

Paper Code: MAL-515 **Total Marks = 15**

Nomenclature of Paper: Complex Analysis-I

Important Instructions

(v) Attempt all three questions from the assignment given below. Each question carries 5 marks and the total marks are 15.

(vi) All questions are to be attempted in legible handwriting on plane white A-4 size paper and to be submitted to the Directorate of Distance Education for evaluation either in person or through Speed Post.

Q1. Show that the Cauchy –Riemann equations is the necessary condition for the function f(z)= u(x,y)+ i v(x,y) to be differentiable at z_0 .Also find out the sufficient condition for f(z) to be analytic in a domain D .

Q2. Using Cauchy 's Integral formula , Evaluate the following integrals :-

(i) $\int_{c} \frac{\sin z}{2z+\pi} dz$ **where C: |z|=1 (ii)** $\int_{c} \frac{z+1}{z^2-3z+2} dz$ **where C: |z|=** $\frac{3}{2}$

Q3. (i) State and prove Lioville' s Theorem .

(ii)Let U be a Harmonic function on the whole complex plane such that U(z) ≥ 0 $for\ all\ z\ in\ C$ **; prove that U is constant.**

ASSIGNMENT -2

GURU JAMBHESHWAR UNIVERSITY OF SCIENCE & TECHNOLOGY, HISAR

DIRECTORATE OF DISTANCE EDUCATION

Programme: M.Sc. (Mathematics) **Semester: I**

Paper Code: MAL-515 **Total Marks = 15**

Nomenclature of Paper: Complex Analysis-I

Important Instructions

(i) Attempt all three questions from the assignment given below. Each question carries 5 marks and the total marks are 15.

(ii) All questions are to be attempted in legible handwriting on plane white A-4 size paper and to be submitted to the Directorate of Distance Education for evaluation either in person or through Speed Post.

Q1. Explain Removable singularity ,Pole , Essential singularity by showing an example for each .

Q2. If f(z)= $\frac{4}{(z^3-5z^2+6z)}$ **, then find all different Laurent series expansion.**

Q3. State and prove Cauchy ' s Residue Theorem .