ASSIGNMENT I

GURU JAMBHESHWAR UNIVERSITY OF SCIENCE & TECHNOLOGY, HISAR

DIRECTORATE OF DISTANCE EDUCATION

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

Paper Code: MAL-521 **Total Marks = 15**

Nomenclature of Paper: Abstract Algebra

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 the square matrix $A = \begin{bmatrix} 0 & 0 & 0 & \dots & 0 \\ 1 & 0 & 0 & \dots & 0 \\ 0 & 1 & 0 & \dots & 0 \\ \dots & \dots & \dots\dots & \dots & \dots \\ \dots & \dots & \dots\dots & & \dots \\ 0 & 0 & 0 \;\; 1 & & 0 \end{bmatrix}$ of order n is similar to M_n. Also fins the minimal polynomial of A.

Q 2. If dimension of V over F is n, then the minimal polynomial of T in A(V) has degree atmost n.

Q 3. Let T be nilpotent. Then show that $5 + T$ is regular. Find the inverse of $5+T^2+7T^3$ it is given that the index of nilpotence of T is 7.

ASSIGNMENT II

GURU JAMBHESHWAR UNIVERSITY OF SCIENCE & TECHNOLOGY, HISAR

DIRECTORATE OF DISTANCE EDUCATION

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

Paper Code: MAL-521 **Total Marks = 15**

Nomenclature of Paper: Abstract Algebra

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. Define the invariant of a nilpotent transformation. Show that the two transformations are similar iff they have same invariants.

Q 2. Define noetherian and artinian modules. Show that the every noetherian module may not be artinian. Also show that every artinian module may not be noetherian.

Q 3. State and prove Hilbert basis theorem.

GURU JAMBHESHWAR UNIVERSITY OF SCIENCE & TECHNOLOGY, HISAR

DIRECTORATE OF DISTANCE EDUCATION

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

Paper Code: MAL-522 **Total Marks = 15**

Nomenclature of Paper: Measure and Integration Theory

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. Define measurable function. Give an example. Let *f* be a function defined on a measurable set E. Show that *f* is measurable iff the set $E(f > r)$ is measurable for each rational number *r*.
2. State and prove F. Riesz theorem for convergence in measure.
3. Prove that every bounded Riemann integrable function is necessarily Lebsegue integrable but not conversely.

ASSIGNMENT-II

Total Marks = 15

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 Fatou's Lemma. Also show by an example that the strict inequality exits in this theorem.
2. State and prove Jordan decomposition theorem.
3. A measurable function *f* is integrable over E if only if $|f|$ is integrable over E. Hence show that the following function $f:[0,\infty)\to R$ is not Lebsegue integral over $[0, \infty)$ where $f(x)=\begin{cases}\frac{\sin x}{x} & \text{if } x\neq 0\\ 0 & \text{if } x=0\end{cases}$

GURU JAMBHESHWAR UNIVERSITY OF SCIENCE & TECHNOLOGY, HISAR

DIRECTORATE OF DISTANCE EDUCATION

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

Paper Code: MAL- 523 **Total Marks = 15**

Nomenclature of Paper: Methods of Applied Mathematics (ASSIGNMENT-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.

1. Find Fourier sine transform of $f(t) = e^{-at}$. Also define self-reciprocal function under Fourier transform.
2. Solve using Fourier transform technique $\frac{d^2y}{dt^2} + 3\frac{dy}{dt} + 2y = e^{-|t|}$
3. Express $\nabla \times \vec{F}$ in orthogonal curvilinear co-ordinates. Deduce this in cylindrical co-ordinates.

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. Let $\vec{A}$ be given vector defined w.r.t. two curvilinear coordinates system (u_1, u_2, u_3) and $(\bar{u}_1, \bar{u}_2, \bar{u}_3)$. Find the relation between the covariant components of the vectors in the two coordinates systems.
2. Find E(X) and variance for the distribution with $f(x) = \frac{1}{a}\left[1 - \frac{|x-a|}{a}\right]$, $|x-b| < a$
3. Is the following statement correct, Explain?
"The mean and variance of Binomial distribution are respectively 6 and 9".
Also prove that for a Normal distribution, the standard deviation is the distance from the axis of symmetry to a point of inflexion.

Ordinary Differential Equations-II **MAL-524** **Assignment I**

M.Sc. Mathematics (Sem. II) **Max. Marks: 15** **May 2017**

1. Find a fundamental matrix for linear systems with constant coefficients. Prove your claim. 5

2. State and prove the necessary and sufficient condition for n solutions of the nth order homogeneous differential equation to be linearly independent. 5

3. Discuss the stability of the critical point (0,0) of the linear autonomous system
$$\frac{dx}{dt} = -x, \qquad \frac{dy}{dt} = -2y.$$ 5

Ordinary Differential Equations-II **MAL-524** **Assignment II**

M.Sc. Mathematics (Sem. II) **Max. Marks: 15** **May 2017**

1. Find the extremals and the stationary function of the functional $\int_0^{\pi} (y'^2 - y^2)\, dx$, that satisfy the boundary conditions $y(0) = 1, y(\pi) = -1$. 5

2. Explain the concept of stability of critical points. Given that the roots of the characteristic equation of linear autonomous system are purely imaginary. Then find out the nature of the critical point (0,0) of the system. 5

3. Derive the Principle of invariance of Euler Equation. Find the extremal of the functional $\int_0^1 y'^2\, dx, \quad y(0) = 0, \quad y(1) = \frac{1}{4}$, subject to the condition $\int_0^1 (y - y'^2)\, dx = \frac{1}{12}$. 5

GURU JAMBHESHWAR UNIVERSITY OF SCIENCE & TECHNOLOGY, HISAR

DIRECTORATE OF DISTANCE EDUCATION

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

Paper Code: MAL-525 **Total Marks = 15**

Nomenclature of Paper: Complex Analysis-II (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.

1. State and prove Montel's theorem.
2. State and prove Runge's theorem.
3. Define unrestricted analytic continuation. State and prove Monodromy theorem.

(ASSIGNMENT-II)

Total Marks = 15

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 Poisson-Jenson's formula.
2. Let ρ be the order of an entire function f(z), then show that $\rho = \lim_{r\to\infty} \sup \frac{\log\log M(r)}{\log r}$ where $M(r) = \text{Max.}|f(z)|$ on $|z| = r$. Hence find the order of the function cos z.
3. State and prove Great Picard theorem.