

M. PHIL. MATHEMATICS Exam. – 2014

SCHEME

1. Compulsory: Dissertation 100 Marks
2. Optional (Any Three) :

Papers	Nomenclature	Total Marks
I	Generalized Hyper geometric Function & Fractional Calculas	100
II	Magneto Fluid Dynamics	100
III	Operations Research	100
IV	Mathematical Theory of Statistics	100
V	Advanced Numerical Analysis	100
VI	Information and Communication Theory	100
VII	Measure and Integration	100
VIII	Non-Newtonian Fluid Dynamics	100

Ordinance 123-V relating to scheme of M. Phil Examination

1. The M. Phil Course should be started/continued in a department when it has got at least three teachers who possess the qualification to supervise research towards the Ph.D. Degree.
2. The following minimum conditions should be ensured before permitting an affiliated college to start the M. Phil course:
 - (a) The college should have fulfilled all the conditions prescribed by the University for Affiliation for the post graduate course.
 - (b) The college must have been permanently affiliated with the University for running post-graduate course in the subject in which it intends to start the M. Phil course.
 - (c) There should be a staff of teachers out of whom at least three possess the qualification prescribed by the University to supervise research towards the Ph. D. Degree.
3. The general provisions of Statutes, Ordinance etc. in respect of admission of student to the examinations of the University including enrolment, discipline, Health & Residence as also for affiliation of colleges will apply for M. Phil Course/ Examination unless otherwise specified hereunder.
4. The Course of study for the M. Phil., degree shall extend over a period of one academic year. There shall be a continuous internal assessment as well as an external assessment. The examination for external assessment shall be written and/or practical as may be prescribed by the Board of Management on the recommendation of the Academic Council from time to time.
5. Every candidate shall be required to offer three written papers and one dissertation (equivalent to one paper) within this framework, each teaching department of the University shall recommend the course of study for the M. Phil, Examination its own subject(s) which shall be placed before the concerned Board of Studies, Faculty, Academic Council and the Board of Management for approval.

6. The number of candidates to be admitted to an M. Phil course in any department each year shall be decided by the department itself but it shall not be less than 5 and more than 15 in Arts/ Social Sciences, 10 in Commerce and 10 in Science. The actual number of students to be admitted in a session will depend on the availability of facilities in the Department concerned.
7. A candidate for admission to the courses of study for the degree of M. Phil, must have obtained a master's degree with at least 55% marks in the post- graduate examination, a second division at the degree examination of the University/ or any other University/Institution recognized as equivalent there to, in to pursue the course.
8. In service candidates shall not be eligible for admission to the M. Phil. course. However, teachers may be allowed to join the course but only after taking leave from their employer for the duration of the course provided they fulfill the minimum eligibility conditions for the course.
9. The placement of every candidate under a Supervisor/guide shall be decided within two months from the date of admission.
10. Every candidate shall be required to attend a minimum of 66% of the lecturers, tutorial, seminars and practical (taken together) held in each paper. A certificate to this effect in respect of every candidate by the Head of the department/ Institution concerned to the Registrar so as to reach him at least 15 days before the commencement of examination.
11. Every candidate for admission to the examination shall submit the University an application in the prescribed form along with the prescribed examination and mark-sheet fee.
12. All paper-setters and examiners for the external assessment shall be external persons (i.e. those who are not working either in the university or in any of its affiliated colleges). The Board of Studies shall prepare a separate panel of examiners for M. Phil. The University Department teaching M. Phil., classes shall suggested a panel of examiners for each paper and dissertation for consideration of the Board of Studies. Appointment of paper setters and examiners shall be made by the examiner's selection committees. If there is no representative from the University teachers on the department teaching M. Phil. for consultation with regard to appointment of paper-setters examiners for the M. Phil., examination in the subject concerned.
13. Unless otherwise specified, candidates' will have the option to answer their question papers and write their dissertation in English or Hindi as permissible at the post- graduate examination of the University in the same subject.
14. The M. Phil. Examinations will normally be held in the month of may each year and the last date of submission of dissertation will normally be 21 days prior to the commencement of the theory examinations. The internal assessment marks should be sent by various departments to the University office before the commencement of the theory papers. If the internal assessment marks of any candidate or from any department are not received before the commencement of the theory examination, marks in internal assessment in each paper be awarded to each candidate in proportion to the marks obtained by him in that particular paper in the external assessment.
15. The answer books and the dissertation of external examination shall be evaluated independently by two examiners and where the difference between the two awards exceeds 20% of the maximum marks allotted to the paper, the answer-book shall be evaluated by a third examiner. In the former case, the average of the two awards and in the later case, the average of the two nearest awards shall be taken into account.
16. Each theory paper shall consist of 100 marks. The dissertation shall also consists of 100 marks, it also be assessed by two external examiners. For a pass, a candidate shall be required to obtain:
 - (a) At least 40% marks in each paper separately. (b) A minimum of 50% marks in the aggregate of all the papers prescribed for the examination. In the marks sheet successful candidates shall be classified as under.
 - (a) First division with distinction, candidates obtaining 75% or more marks in the aggregate.
 - (b) First division candidates obtaining 65% or more but less than 75% marks in the aggregate.
 - (c) Second division. All the rest.
17. Three periods of one hour each per week shall be provided for each theory paper and two periods for dissertation.

18. Omitted. The following minimum condition should be ensured before permitting an affiliated college to start M. Phil. Course:
- (a) The college should have fulfilled all the conditions prescribed by the University for Affiliation for the post-graduate course.
 - (b) The college must have been permanently affiliated with the University for running post graduate course in the subject in which it intends to start the M. Phil. Course.
 - (c) There should be at least six-post-graduate teachers out of whom at least three should have already been recognized as Research Supervisors and possess at least ten years teaching experience of post graduate classes. The teachers should possess the minimum qualification prescribed by the University for the Post of Reader.
 - (d) There should be staff of 6 teachers out of whom at least three possess the qualification prescribed by the University to supervise research towards the Ph. D. Degree.
 - (e) The college will always maintain teaching staff for the M. Phil. Course as per University rules.
 - (f) The college should possess adequate reference books and research journals in the subject in which a college intends to start M. Phil. Course.

PAPER - I

Generalized Hyper Geometric Function & Fractional Calculus

Time : 3 hours

Max. Marks 100

Note : Candidates will be required to attempt any Four out of Seven question.

1. H- function of one variable – definition, special cases, differential formulas, finite and infinite series and integrals. H- function of two variables definition, special cases, differential formulas and integrals.
2. Obtaining generating functions, series manipulation methods, Rainville methods, the factorial functions and the generalized hypergeometric functions, obtaining generating functions from expansions in powers of x. Rainville methods using an auxiliary variable, a bilinear generating function, bilateral generating functions.
3. Definitions of Reimann – Liouville And Weyl : Fractional Calculus, Fractional Derivatives and Integrals, Laplace Transform of Fractional Derivatives, Leibniz Rule for the Fractional Derivatives. R-L Fractional Derivatives involving Hyper-Geometric Functions.

Books Suggested :

1. The H- function with applications in statistics and other disciplines. Mathai ; A.M./ and Saxena, R.K. John Willey and sons, New York.
2. The H- function of one and two variables with applications, Srivastava, H.M., Gupta K.C. and Goyal, S.P., South Asian Publishers, New Delhi, Chennai
3. Obtaining generating functions, M.C. Bride E.B. Springer Verlag – Berlin, New York Chapter -2

4. A treatise on generating functions, Srivastava, H.M. and Manocha, H.L. Ellis Horwood Ltd. John Willey and sons, New York
5. An introduction to the fractional calculus and fractional differential equations miller, K.S. and Ross, B.
6. Fractional Integrals and derivatives : Theory and Applications, Samko S.G., Kilibas A. and Marichev, O.L. Gordon and Breach science publishers, New York.

PAPER - II (Magneto Fluid Dynamics)

Time : 3 hours

Max. Marks 100

Note : Candidates will be required to attempt any Four out of Seven question.

Maxwell's electromagnetic field equations. Equation of motion of a conducting fluid. Energy equation. Magneto fluid dynamics approximations. Properties of MFD equations. MFD equations for special cases. Magnetic Reynolds number. Boundary conditions. Alfven's theorem Magnetic body force. Ferraro's law of isorotation.

One-dimensional flows-Quasi one-dimensional assumptions. Equation of continuity. Equations for average electric current density electric and magnetic fields. Equations of motion and energy. Steady flow of inviscid. Viscous and heat conducting fluids.

Viscous flows-Hartmann flow. Hydro magnetic couette flow. Hydromagnetic Flow through an annulus. Hydromagnetic flow in a rotating annulus. MFD pipe flow. MFD boundary layer approximations. MFD Flow past on infinite flat plate. MFD flow past a semi-infinite flat plate. MFD Rayleigh problem. MFD wakes.

MFD Wave phenomena-Electromagnetic waves. Gas dynamic waves. Magneto gas dynamic waves. Sub and Super Alfven's waves. Waves of infinite amplitude. Normal and oblique. MFD shock waves.

MFD Applications-Astrophysical and geophysical applications. MFD ejectors. MFD accelerators. MFD Lubrication. MFD thin airfoil. MFD power generation.

Tensor electrical conductivity. Hall current and ion slip. MHD channel flow and quasitwo-dimensional flow, with tensor electrical conductivity.

References :-

- 1 K.R Ciamer and S.I. Pai, Magnetofluid Dynamics for Engineers and Physicists, Sorpta Publishing Company, Washnigton D.C., 1973
2. S.I. Pai, Megneto gas Dynamics, and Plasimadynamics, Soringer-Vertag, New York, 1952
3. J.A. Sngecliff, Magneto hydrodynamics, Pergamon Press, London, 1965.
4. F.Chatton, Text book on Fluid Dynamics, CBS Publications, Delhi. 1985.

PAPER - III (Operation Research)

Time : 3 hours

Max. Marks 100

Note : Candidates will be required to attempt any 4 out of 7 question.

Necessity of Operation Research in Industry, problem formulation and model construction,

Replacement problems and system reliability: Replacement of items that fail suddenly, Group replacement, Renewal theory, Reliability and system failure rates,

Project Planning and Control with PERT / CPM, Simulation,

Linear Goal Programming, Geometric Programming, Separable convex programming, Parametric Linear Programming: Upper Bound Technique, Interior Point algorithm.

Inventory Problems: Stochastic models

Queuing System :- Steady state solution of queuing model, Poisson queue models,

Dynamic Programming

Marketing System: Application of dynamic Programming to marketing problem, introduction of new product, objective in selling market price and its policies, purchasing under fluctuatory prices, Advertising and promotional decisions, Brand switching analysis: Distributions, decisions

References :-

1. Kanti Swaroop: Operations Research, S.Chand Publications
2. S.D.Sharma: Operations Research
3. N.S.Kambo: Mathematical Programming Techniques, Affiliated East-West Press, New Delhi
4. H.A.Taha, Operations Research, Macmillen Publishing Co. New York

PAPER - IV (Mathematical Theory of Statistics)

Time : 3 hours

Max. Marks 100

Note : Candidates will be required to attempt any Four out of Seven question.

Analysis of Variance: Two factors and three factors of classification Randomized Blocks.

Theory of Estimation : Different types of Estimators, Maximum likelihood Estimator and their properties, Other methods of Estimation, Interval Estimation, Sampling Theory-Chi Square distribution-Fisher's Theorem, Coch Theorem, Distributing of non-control chi-square Testing of Homogenereter with the help of Chi-Square Bartillets test, Fisher test for comparing the means of two normal populations.

Distribution of non-central F. Student Newmann Rules Test, Tests for linearity of regression, Multiple Regression Testing of hypothesis, Curvilinear regression Newmann-persons test the hypothesis, Multivariate Analysis-Characteristic function, Distribution of quadratic forms, Distribution correlation coefficient in the non-null case, Distribution of partial correlation coefficient, Distribution of Multiple

correlation in the Null case and non-Null case, Distribution of Hotellings's T2 and its uses, Distribution Mahhnopis D2.

Wisharts Distribution, Non-Parametric Tests; Kolmogorive tests, Kimmogorive Simithow test, The sign Waldwolfeway test, Test of random Medium Test for two samples Wilcoxon Signed rank test Mann Whitney T.U. test. Sequential analysis-introduction walds, probability test, Power functions. Average sample number (ANS), Sampling inspection SPR and Truncase of Sequestia test Procedure, Stochastic Process, Markov process and Markov Chains, Poission process, are birth and death process, Waiting line, Servicing of Machines with several repairmen.

References: -

1. Gupta, Kapoor, Fundamentals of Statistics:, S.Chand Publications
2. Kapoor, Saxena :Mathematical Statistics, S.Chand Publications
3. K.S.Trivedi , Probability and Statistics:, PHI Ltd. New Delhi
4. S.M.ross, Introduction to Probability Models, Academic Press

PAPER - V (Advanced Numerical Analysis)

Time : 3 hours

Max. Marks 100

Note : Candidates will be required to attempt any Four out of Seven question.

Errors in Numerical Calculations : Numbers and their accuracy, errors and their analysis, General error formula, Error in a series Approximation.

Two Point Boundary value Problem : Linear ordinary differential equations, Non-Linear ordinary differential equations, Non-uniform grid methods for the second order Boundary value problems

Numerical Solution of Integral Equations : Integral equations, Finite difference methods, Method for degenerate Kernels, Method of Invariant Imbedding, Method using Generalized Quadrature, Evaluation of singular integrals.

Numerical Solution of partial Differential Equations : Finite Difference Approximations to Derivatives, Laplace's Equations-Jocobi's method, Gauss Siedel and successive over Relaxation methods , Parabolic and Hyperbolic equations, Iterative method and choice of initial approximation.

Finite Element Methods: Introduction, Residual Methods, Variational methods, Element, Assembly of elements equatic application value problems and initial value problems such as flow or local fluids, Flow of Viscous fluids, Transient heat conduction.

References: -

1. M.K.Jain: Numerical solution of Differential Equations, New Age International Ltd
2. J.Smith: Numerical solution of Differential Equations

PAPER - VI (Information & Communication Theory)

Time : 3 hours

Max. Marks 100

Note : Candidates will be required to attempt any Four out of Seven question

Some basic ideas of theory of Probability - Basic concepts Theorem of total and compound probabilities, Baye's Theorem, Discrete and continuous probability distributions, Tree and State diagram, Stochastic process, Markov process and probability transition matrix, Expected value of a random variables.

Communication system and information Theory-Communication process, Source model and source coding, Channel model and channel of coding A Measure of Information-Mathematical foundation of entropy function its uniqueness and properties, Definition of mutual information Average mutual information, Entropies and mutual information for continuous ensemble mathematical difficulties involved and maximization of entropies.

Communication under Stochastic. Regimes-Stochastic nature of communication, Finite Markov chains, A basic theorem, Regular Markov chains, Entropy of a simple Markov chain.

Coding for discrete source - Average codeword Length, Source coding theorem, Kraft inequality, Shannon- Fano, Non-Binary and Huffman encoding.

Discrete Memory Less channels and capacity- Models for communication channels, Classification of channels, Calculation of channel capacity, Decoding scheme and its properties, Idea observer decision scheme, Discrete channels with finite memory and without anticipatory, Behavior, Connection of the source and the discrete channel with memory.

Techniques for coding and decoding parity check code Generator Matrices, Parity check matrices for systematic parity check codes, Hemming codes, Group code, cyclic code, BCH codes.

Fundamental theorem on information theory, Weak converse of fundamental theorem.

References: -

1. Reza F.M. : Introduction of Information Theory
2. Mathai A.M. and Rathi P.N. : Axiomatic Foundations of some concepts of Information Theory.

PAPER - VII (Measure and Integration)

Time : 3 hours

Max. Marks 100

Note : Candidates will be required to attempt any Four out of Seven question.

Measurable Spaces : Ring, Algebras, Monotonic classes, Measurable space.

Measurable functions : Lebesgue Measurable functions, Algebras of measurable functions, Sequences of measurable function convergence in measure, Riesz's Theorem Simple Functions, Luzin's Theorem.

Outer measures : Outer Measure (CARATHÉODORY), Measurable sets, Algebra of measurable sets, Measures of Locally compact Hausdorff space.

Integration and Summable Function : Measurable dissection of set, Lebesgue integral, Passage of the limit under the sign of integral, Lebesgue, Dominated convergence theorem, Riesz's Representation Theorem, Regular measures.

L_p - spaces, L_p spaces, Holder's inequality, Minkowski's inequality, Completeness of L_p spaces.

Product measures, Product Measurable spaces section, Fubini's theorem, Integration of vector, Valued function, Random measure, Functions on-space of semi continuous functions, Lioi's theorem, Measure induced by Radon measure and its properties.

Radon - Nikodym theorem, Signed measures, Hahn decomposition theorem, Absolutely continuous measure, Lebesgue Radon-Nikodym theorem.

References: -

1. S.K. Berbarian: Measure and integration, Chelsea Publishing Co.
2. G.D. Bera: Measure Theory and Integration, Wiley Eastern Ltd.
3. P.K. Jain & V.P. Gupta: Lebesgue Measure and Integration, New Age International Ltd

PAPER - VIII (Non-Newtonian Fluid Dynamics)

Time : 3 hours

Max. Marks 100

Note : Candidates will be required to attempt any Four out of Seven questions.

Classification of non-Newtonian fluids Tube flow and shear thickening, rod-climbing, Interpretation of a tangential annular flow and axial annular flow experiments, Extricate swell.

Shear flow : Kinematics and classification, Kinematics of steady fluids flow, Steady tangential annular flow and steady helical flow, Unidirectional shear flows, Form of the stress tensor, Steady shear flow martial function, Unidirectional Unsteady shear Flow martial function, Measurement of viscosity and normal stress coefficients in (1) the cone and plate instrument and (2) the Parallel disk instrument.

The generalized Newtonian fluid : Its origin and usefulness, Definition of power law, Eyring, Reiner-Philippoff, Ellis and Bringham Fluids, Flow of power law fluid, (1) Between two parallel plates, (2) Helical flow, Flow of Ellis fluid : (1) Plane flow, (2) Through a circular pipe (3) through an annulus, (4) Between pipelining cylinders.

References :-

1. W.H.Besaint and A.S.Ramsey. Treatise on Hydromechanics, Part II, CBS Publishers, Delhi 1988.
2. G.K. Batchelor and Introduction to Fluid Mechanics, Foundation, Books, New Delhi 1991.
3. F.Chortion, Textbook of fluid Dynamics, C.B.S, Publishers, Delhi 1985
4. J.D.Anderson, Computational Fluid Dynamics: The Basics with Applications, McGraw Hill.
5. L.D.Landau and E.M. Lipschitz, Fluid Mechanics, Pergamon Press, London, 1985.