KARNATAK UNIVERSITY, DHARWAD

Department of Mathematics

'A' Grade
NAAC Accredited 2008

University with potential for excellence

SYLLABUS

OF

COURSE WORK FOR Ph.D PROGRAMME

IN

MATHEMATICS

(*w.e.f. 2012-2013 & onwards*)

KARNATAK UNIVERSITY, DHARWAD
Department of Mathematics
Course Work for Ph.D. Programme
(w.e.f. 2012-13 and onwards)
Course Structure and Scheme of Examination

Sl. No	Course	Paper Code No.	Name of the Course	Contact Hours per Week	Maximum Marks: Continuous Assessment (IA)	Maximum Marks: Course End-Examination	Maximum Marks: Total	Examination Hours
01	Course I: Research Methodology	PH83T01	Research methodology	04	50	50	100	02
02	Course II: Cognate/ Core Subjects	PH83T02	Advances in mathematics	04	50	50	100	02
03	Course III: Area of Research	PH83T03A	Advanced Topics in Topology	04	50	50	100	02
		PH83T03B	Graph Dyanamics					
		PH83T03C	Advanced Topics in Manifolds					
		PH83T03D	Tensor Analysis and Riemannian Geometry					
		PH83T03E	Value Distribution Theory					
		PH83T03F	Fluid Mechanics					
		PH83T03G	Fourier and Wavelet Based Numerical Analysis					
					150	**150**	**300**	
Viva Voce							**50**	
							350	

Continuous Internal Assessment (IA) Marks of the course work shall be awarded based on

(a) Assignments – 10 marks
(b) Seminar – 10 marks
and (c)Tests – 30 marks

} Total – 50 marks

Paper	Internal Assessment Components (Marks): Test-I (15)	Test-II (15)	Seminar (10)	Assignment (10)	Total
1. Course – I: Research Methodology	5th week	9th week	12th week	14th week	50
2. Course- II Advance in Mathematics	5th week	9th week	12th week	14th week	50
3. Course III – Area of Research	5th week	9th week	12th week	14th week	50

Programme Outcomes (POs)

PO1. Identify the relevant research problem.
PO2. Formulate and analyze the problems using principles of Mathematics.
PO3. Undertake original research in a specific topic.
PO4. Communicate effectively the findings of research through publications and presentations.
PO5. Enable for critical thinking to carry out scientific and systematic investigation for the study.
PO6. Use knowledge and methods to draw the conclusion.
PO7. Apply reasoning to assess issues and the consequent responsibilities relevant to the professional practice.
PO8. Apply mathematics to understand the societal problems.
PO9. Able to tackle the real world problems with mathematical approach.

SYLLABUS OF COURSE WORK FOR PH.D PROGRAMME

Course I:

Paper Code and Name: PH83T01: Research Methodology	Teaching Hours: 48
Course Outcomes (COs)	
After completing this paper, the students will be able to: CO1. Understand the meaning of research and objective of research. CO2. Identify the problem and techniques for solutions. CO3. Design research plan. CO4. Use e-resources. CO5. Write the dissertation.	

Unit No.	**Content**	**Teaching Hrs**
1	Meaning of research, Objective of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Criteria of good research.	6
2	What is research problem? Selecting the problem, Necessity of defining the problem, Technique involved in defining a problem, an illustration, Conclusion.	6

3	Meaning of research design, Features of a good research design, Important concepts relating to research design	6
4	Different research designs, Developing a research plan.	6
5	Paper collection, Usage of digital library, Google search, Downloading the papers from web.	6
6	Proof Techniques, Latex.	6
7	Meaning of Interpretation, Why Interpretation? Technique of Interpretation, Precaution in Interpretation.	6
8	Significance of Report writing, Different steps in writing Report, Layout of the Research Report, Types of Report, Oral Presentation, Precautions for writing Research Reports, role of computer in research.	6

Reference:

1. C.R. Kothari “Research Methodology”, : New Age International, 2009

Q. P. Pattern:

Total 8 questions. Each carrying 10 marks.
Solve any five (5X10 = 50)
Max. Mark - 50 Marks. 2 Hrs Exam

Course II : Cognate/Core Subject

Paper Code and Name: PH83T02: Advances in Mathematics	Teaching Hours: 48
Course Outcomes (COs)	
After completing this paper, the students will be able to: CO1. Understand semiopen sets, semicontinuity, Bitopological spaces and Fuzzy topological spaces CO2. Quantify graphs and trees. CO3. Understand integrals of 1-forms in R^3, Integral of 2- forms in R^3 . CO4. Apply Weierstrass factorization theorem, Hadamard’s factorization theorem, Picard’s and Borel’s theorems. CO5. Discuss Tensors of type (p,q) on finite dimensional vectors space and on manifold. CO6. Understand the topology of manifolds. CO7. Understand properties of fluids - density, specific weight, specific volume, specific	

gravity, temperature, viscosity. CO8. Apply discrete and Fast Fourier Transforms.

Unit No.	Content	Teaching Hrs
1	**Topology :** semiopen sets, semicontinuity, Bitopological spaces, Fuzzy topological spaces	6
2	**Discrete Mathematics:** Enumeration of graphs/trees, Groups and vector spaces associated with graph.	6
3	**Real Analysis :** Integrals of 1-forms in R^3, Integral of 2- forms in R^3 , Stokes formula, divergence theorem.	6
4	**Complex Analysis:** infinite product, Elementary properties, Weierstrass primary factors, Basic properties, Weierstrass factorization theorem, Hadamard's factorization theorem, Picard's and Borel's theorems, Applications of Hadamard's factorization theorem.	6
5	**Tensor Algebra :** Multilinear Functions, Tensors of type (p,q) on finite dimensional vectors space and on manifold, Tensor algebra on mixed tensors.	6
6	**Differentiable Manifolds:** Manifolds, Topology of manifolds, Smooth functions – Tangent, Vectors, Diff, maps, Jacobian of derivative map, Vector fields, Curves and Integral curves, Standard connections on R^n	6
7	**Mechanics :** Fluid – definition, distinction between solid and fluid - Units and dimensions - Properties of fluids - density, specific weight, specific volume, specific gravity, temperature, viscosity,	6
8	**Fourier Analysis:** Inner Product and Orthogonal Projections, Discrete and Fast Fourier Transforms, Fourier Series for Periodic Functions.	6

References:

1) N.Levine, "Semiopen sets and semicontinuity", Amer. Math Monthly 1965
2) C.W.Patty, "Bitopological spaces".
3) C.L.Chang, "Fuzzy Topological spaces", 1968
4) G.Chartrand and Ping Zhang, "Introduction to Graph Theory", Tata MeGraw-Hill Edition,New Delhi.
5) F.Harary, "Graph Theory", Addison-Welley, Reading, MA,1969
6) Walter Rudin- "Principles of Mathematical Analysis" 3rd Edition, McGRAW-HILL International Editions.
7) John B. Conway, "Functions of one complex variable" (second edition) Springer Verlag, New York(1973)

8) Shanti Narayan and Dr. P.K. Mittal “Theory of functions of a complex variable” S. Chand Higher Academic.
9) K.S. Amur, D. J. Shetty and C. S. Bagewadi, “Topics in Differential Geometry “, Narosa Publishers
10) : Barret O’Neil “Elementary Differential Geometry “
11) Bansal, R.K., “Fluid Mechanics and Hydraulics Machines”, (5th edition), Laxmi publications (P) Ltd., New Delhi, 1995.
12) G. Bachman et. al., Fourier and Wavelet Analysis, Springer Pub., (2009).
13) D.F.Walnut, “An introduction to wavelet Analysis”, Birkhauser Pub,.(2009)
14) T.W.Kornev, “Fourier Analysis”, Oxford University Press,(2000)
15) Y. Nievergelt, Wavelets made easy, Birkhauser Pub., (1999).

Q. P. Pattern:

Total 8 questions. Each carrying 10 marks.
Solve any five (5X10 = 50)
Max. Mark - 50 Marks. 2 Hrs Exam

Course III : Area of Research

Paper Code and Name: PH83T03A: Advanced Topics in Topology	Teaching Hours: 48
Course Outcomes (COs)	
After completing this paper, the students will be able to: CO1. Understand paracompact spaces and perfect maps. CO2. Discuss metacompact spaces. CO3. Understand strongly paracompact spaces and fully normal spaces. CO4. Discuss small inductive dimension function and large inductive dimension function.	

Unit No.	**Content**	**Teaching Hrs**
1	Paracompact Spaces : Point-finite families and Locally-finite families. Properties, paracompact Spaces. properties.	6
2	Parfect maps and Paracompactness, Cushioned & Barycentric Refinements.	6
3	Partition of unity, Metacompact spaces. (Weakly paracompact spaces)	6
4	Strongly Paracompact spaces, Countably paracompact spaces, Perfectly normal spaces.	6

5	Fully normal spaces, collectionwise normal spaces, Screenable and Strongly screenable Spaces.	6
6	Lebasgue's covering dimension function-dim characterizations, countable sum theorems, The subset theorems.	6
7	The small inductive dimension function – ind, The subset theorem, properties	6
8	The large inductive dimension function –ind, The subset theorem, interrelations properties. The local dimension theory	6

References:

1. A.R. Pears, Dimension Theory of General Topological Spaces, Academic Press.
2. R. Engelking, General Topology, Polish Scientific Publishers
3. Stephen Willard : General Topology

Q. P. Pattern:

Total 8 questions. Each carrying 10 marks.
Solve any five (5X10 = 50)
Max. Mark - 50 Marks. 2 Hrs Exam

Paper Code and Name: PH83T03B: Graph Dynamics	Teaching Hours: 48
Course Outcomes (COs)	
After completing this paper, the students will be able to: CO1. Apply Graph Transformations. CO2. Find topological parameters and distance in graphs. CO3. Compute eigenvalues of graphs. CO4. Determine the domination parameters of a graph. CO5. Compute chromatic polynomial of graphs.	

Unit No.	**Content**	**Teaching Hrs**
1	Graph Transformations- Graph valued functions	6
2	Topological Graph Theory and Topological parameters sum and product of graphs, Genus of a graph, packings and covering of graphs.	6
3	Distance in graphs: The centre of a graph, Distance vertices.	6
4	Distance between graphs and subgraphs	6

5	Eigen values of graphs – The characteristic polynomial, Linear algebra of Real symmetric matrices.	6
6	Domination in Graphs- The domination number of a graph	6
7	Dominating graphs: Minimal Dominating Graphs, Common Minimal dominating graphs etc.	6
8	Coloring of graphs- Chromatic polynomial graphs.	6

References

1. J. A. Bondy and U.S.R. Murthy, Graph theory, Springer
2. Douglas B. west, Introduction to Graph theory, Prentice- Hall of India, New Delhi
3. G. Chartrand and L. Lesniak, Graphs and Diagraphs, Chapman and Hall/ CRC.
4. V.R.Kulli, Theory of Domination in graphs, vishwa International publications, Gulbarga, india.
5. O. Ore, Theory of Graphs, Amer. Math. Soc. Colloq. Publ., 38, providence, (1962).

Q. P. Pattern:

Total 8 questions. Each carrying 10 marks.
Solve any five (5X10 = 50)
Max. Mark - 50 Marks. 2 Hrs Exam

Paper Code and Name: PH83T03C: Advanced Topics in Manifolds	Teaching Hours: 48
Course Outcomes (COs)	
After completing this paper, the students will be able to: CO1. Understand manifolds, Tangent vectors and Tangent spaces. CO2. Discuss diffeomorphism on manifold and Homotopy. CO3. Discuss various operations on differential forms. CO4. Understand vector bundles and Fiber bundles. CO5. Discuss Linear connection and Affine connections.	

Unit No.	**Content**	**Teaching Hrs**
1	Definition and examples of manifolds, Tangent vectors and Tangent	6

	spaces, Vector fields.	
2	Smooth maps and diffeomorphism on manifold, cut-off functions, Covering spaces and the fundamental group, Homotopy.	6
3	Immersion and Submersion, Weakly embedded sub manifolds.	6
4	Differential forms, Various operations on differential forms, Frobenius Theorem.	6
5	Vector bundles, the tangent bundle of a manifold, Geodesies and parallel translation of a vector.	6
6	Linear connection, Affine connections, Torsion tensor of Affine connections, Curvature tensor of Affine connections.	6
7	Connections in vector bundles, Curvature connection form and Curvature form.	6
8	Fiber bundles, Characteristic classes, Principle bundles, Structure group.	6

References :

1. Jeffrey M Lee. " Manifolds and Differential Geometry", Graduate studies in Mathematics, Vol. 107, AMS. (2009)
2. U. C. De and A. A. Shaikh. "Differential Geometry of Manifolds", Narosa (2009)
3. Shigeyuki Morita. "Geometry of Differential forms" Mathematical Monograph, AMS (2009)
4. S. Kumaresan, "A Course in Differential Geometry and Lie Groups", HBS

Q. P. Pattern:

Total 8 questions. Each carrying 10 marks.
Solve any five (5X10 = 50)
Max. Mark - 50 Marks. 2 Hrs Exam

Paper Code and Name: PH83T03D: Tensor Analysis and Riemannian Geometry	Teaching Hours: 48
Course Outcomes (COs)	
After completing this paper, the students will be able to: CO1. Understand Tensor Algebra and Tensor Field. CO2. Understand differentiation of Tensors and Intrinsic differentiation. CO3. Understand Riemannian manifolds and hypersurfaces. CO4. Discuss complex manifolds and contact manifolds.	

Unit No.	Content	Teaching Hrs
1	Tensor Algebra: Systems of Different orders, Summation Convention, Kronecker Symbols, Covariant and Contravariant vectors, Tensors of Second Order, Mixed Tensors, Zero Tensor	6
2	Tensor Field, Equality of Tensors, Symmetric and Skew – symmetric tensors, Outer multiplication, Contraction and Inner Multiplication, Reciprocal Tensor of Tensor, Relative Tensor.	6
3	Tensor Calculus: Introduction, Riemannian Space, Christoffel Symbols and their Properties, Covariant Differentiation of Tensors, Riemann-Christoffel Curvature Tensor, Intrinsic Differentiation, Geodesics,	6
4	Reimannain Manifolds: Riemannian metric, Riemannian connection, Fundamental theorem of Riemannian geometry, Curvature and Torsion tensors, Bianchi identities, Sectional curvature, Space of constant curvature, Curves and Geodesics in Riemannian manifolds.	6
5	Submanifolds & Hypersurfaces: Normals. Gauss. Weingarten equation. Lines of curvature. Generalized Gauss and Maniardi - Codazi equations.	6
6	Differential Forms:Exterior derivative, Contraction, Lie derivative, General covariant derivative, Schur's theorem, One parameter group of transformations, Complex vector field.	6
7	Complex manifolds: Almost Complex manifolds, Complex manifolds, Almost Hermite manifolds, Hermite Manifolds, Kahler manifolds, nearly Kahler manifolds, paraKahler manifolds, Examples.	6
8	Contact manifolds: Almost contact manifolds, K-contact manifolds, Sasakian and nearly Sasakian manifolds, Contact metric manifolds, Kenmotsu manifolds, trans-Sasakian manifolds, para contact manifolds, Examples.	6

References:

1) Riemannian Geometry : M.P. Do Carmo
2) An Introduction to Differential Manifolds and Reimannian Geometry: W.M. Boothby.
3) An Introduction to Differential Geometry : K.S.Amur, D.J. Shetty and C.S. Bagewadi
4) An Introduction to Differential Manifolds : N.J. Hicks
5) An Introduction to Differential Manifolds : Y. Matsushima
6) An Introduction to Differential Manifolds : Nirmala Prakash
7) Differential Geometry of Manifolds : U. C. De and A. A. Shaikh
8) Tensor Calculus : U.C. De, A.A. Shaikh and J.Sengupta
9) A course in tensors with applications to Riemannian geometry: R. S. Mishra,
10) Structures on a differentiable manifold and their applications: R. S. Mishra.

Q. P. Pattern:
Total 8 questions. Each carrying 10 marks. Solve any five (5X10 = 50)
Max. Mark - 50 Marks. 2 Hrs Exam

Paper Code and Name: PH83T03E: Value Distribution Theory	Teaching Hours: 48
Course Outcomes (COs)	
After completing this paper, the students will be able to: CO1. Understand properties of entire and meromorphic functions. CO2. Discuss Poisson integral formula, poisson-Jenson theorem, and Jensen's formula. CO3. Understand characteristic function, proximate function, types of meromorphic function. CO4. Apply Second fundamental theorem of Nevanlinna, Picards theorem, Borel theorem and Montel's theorem. CO5. Discuss maximum term and rank of an entire function, Asymptotic values, Asymptotic curves.	

Unit No.	**Content**	**Teaching Hrs**
1	Growth of an entire function, Basic properties of entire functions using M(r,f) , Order and type of entire functions.	6
2	Poisson integral formula, poisson-Jenson theorem, Jensen's formula and applications.	6
3	Characteristic function, proximate function, counting function, Basic properties of characteristic functions, Nevanlinna's first fundamental theorem.	6
4	Characteristic function of elementary functions, Cartan's lemma and its applications.	6
5	Order and type of meromorphic function, proximate order and slowly growing functions.	6
6	Second fundamental theorem of Nevanlinna, Picards theorem, Borel theorem and Montel's theorem.	6
7	Deficient values and relation between the various exceptional, Fundamental inequality of deficient values, Uniqueness theorem.	6
8	Maximum term and rank of an entire function, Asymptotic values, Asymptotic curves, connection between asymptotic value and varies exceptional values.	6

References:

1) A. I. Markushevich: Theory of functions of a Complex Variables, Vol. Ii Prentice – Hall (1965).
2) A. S. B. Holland: Introduction to Theory of Entire Functions, Academic Press, New York (1973).
3) C. L. Siegel: Nine Introductions in Complex Analysis, North Holland (1981).
4) W. K. Hayaman: Meromorphic Functions, Oxford University Press (1964).
5) Yang Lo: Value Distribution Theory, Springer Verlag, Scientific Press (1993).
6) I. Laine: Nevanlinna Theory and Complex Differential Equations, Walter de Gruyter, Berlin (1993).

Q. P. Pattern:

Total 8 questions. Each carrying 10 marks. Solve any five (5X10 = 50)
Max. Mark - 50 Marks. 2 Hrs Exam

Paper Code and Name: PH83T03F: Fluid Mechanics	Teaching Hours: 48
Course Outcomes (COs)	
After completing this paper, the students will be able to: CO1. Discuss distinction between solids and fluid, distinction between liquid and gas fluid continuum. CO2. Understand flow properties. CO3. Understand the classification of flow. CO4. Discuss Euler's equation and Bernoulli's equation with assumption and limitation. CO5. Discus flow through pipes and orifices.	

Unit No.	**Content**	**Teaching Hrs**
1	1.1 Scope and importance of Subject, 1.2 Definition of Fluid, Distinction between solids & fluid, 1.3 Distinction between liquid & gas fluid continuum.	6
2	2.1 Definition of pressure, units and dimensions, 2.2 Pressure at a point, 2.3 Pascal's law, 2.4 Hydrostatic pressure law	6
3	3.1 Definition of total pressure, Center of pressure, Centroid, centroidal depth, depth of center of pressure, 3.2 Equation for hydrostatic force and depth of center of pressure on plane surfaces (vertical and inclined)	6
4	4.1 Description of fluid flow, 4.2 Lagrangian and Eulerian approaches. 4.3 Classification of flow, steady & unsteady, uniform and non-uniform,	6
5	5.1 Concept of Inertia force and other forces causing motion, 5.2 Derivation of Euler's equation and Bernoulli's equation with	6

	assumption and limitation.	
6	6.1 Flow through pipes, Reynolds number, classification of flow, 6.2 Definition of hydraulic gradient, energy gradient., 6.3 Major and minor losses in pipe flow.	6
7	7.1 Flow through Orifices; classification, 7.2 Hydraulic co-efficients of an Orifice and relation between them.	6
8	8.1 Flow over notches, classification, 8.2 Equation for discharge over rectangular and trapezoidal notches.	6

References:

1. Bansal, R.K., “Fluid Mechanics and Hydraulics Machines”, (5th edition), Laxmi publications (P) Ltd., New Delhi, 1995.
2. White, F.M., “Fluid Mechanics”, Tata McGraw-Hill, 5th Edition, New Delhi, 2003.
3. Ramamirtham, S., “Fluid Mechanics and Hydraulics and Fluid Machines”, Dhanpat Rai and Sons, Delhi, 1998.
4. Som, S.K., and Biswas, G., “Introduction to fluid mechanics and fluid machines”, Tata McGraw-Hill, 2nd edition, 2004.
5. Hydraulics and Fluid Mechanics by P.N. Modi and S.M. Seth Standard Book House, New Delhi
6. Fluid Mechanics and Hydraulic Machines by Dr. R.K. Bansal, Lakshmi Publications, New Delhi.
7. “Fluid Mechanics”, Jain, A.K.: Khanna Publishers, New Delhi.

Q. P. Pattern:

Total 8 questions. Each carrying 10 marks. Solve any five (5X10 = 50)
Max. Mark - 50 Marks. 2 Hrs Exam

Paper Code and Name: PH83T03G: Fourier and Wavelet Based Numerical Analysis	Teaching Hours: 48
Course Outcomes (COs)	
After completing this paper, the students will be able to: CO1. Apply Least-Squares Approximation CO2. Discuss numerical solution of Partial Differential Equations CO3. Apply Discrete and Fast Fourier Transforms. CO4. Understand Wavelets and Wavelet transform. CO5. Discuss Orthogonal Wavelet Systems. CO6. Understand Convergence Properties of Wavelet Expansions.	

Unit No.	Content	Teaching Hrs
1	**Approximation of Functions**: Least – Squares Approximation, Chebyshev Polynomial Approximation, Economized Power Series, Pade Approximation, Fourier Series Approximation (For Periods other than 2π), Harmonic Analysis.	6
2	**Numerical Solution of Partial Differential Equations:** Derivation of the one dimensional wave equation, Derivation of the one dimensional heat equation, Numerical Solution of the one dimensional wave equation, Numerical Solution of the one dimensional heat equation, Numerical Solution of the Laplace's equation.	6
3	**The Discrete and Fast Fourier Transforms:** The Discrete Fourier Transform, The Inversion Theorem for the DFT, Cyclic Convolution. The Fast Fourier Transform for $N = 2^k$, The Fast Fourier Transform for $N=RC$.	6
4	**Continuous Wavelet and Short Time Fourier Transform:** Wavelet Transform-A First Level Introduction; Mathematical Preliminaries-Fourier Transform: Continuous Time–frequency Representation of Signals, The Windowed Fourier Transform (Short Time Fourier Transform), The Uncertainty Principle and Time-frequency Tiling; Properties of Wavelets Used in Continuous Wavelet Transform, Continuous versus Discrete Wavelet Transform.	6
5	**Discrete Wavelet Transform:** Haar Scaling Functions and Function Spaces, Nested Spaces, Haar Wavelet Function, Orthogonality of $\Phi(t)$ and $\Psi(t)$, Normalization of Haar Bases at Different Scales, Standardizing the Notations, Refinement Relation with Respect to Normalized Bases, Support of a Wavelet System, Daubechies Wavelets, Seeing the Hidden-Plotting the Daubechies Wavelets.	6
6	**Designing Orthogonal Wavelet Systems-A Direct Approach:** Refinement Relation for Orthogonal Wavelet Systems, Restrictions on Filter Coefficients, Designing Daubechies Orthogonal Wavelet System Coefficients, Design of Coiflet Wavelets, Symlets, An Intriguing Property of Orthogonal Scaling Function.	6
7	**Applications of Wavelets:** Haar Wavelet Expansion: Haar Functions and Haar Series, Haar Sums and Dyadic Projections, Completeness of the Haar Functions; Multiresolution Analysis: Orthonormal Systems and Riesz Systems, Scaling Equations and Structure Constants, From Scaling Function to MRA, Mayer Wavelets, From Scaling Function to Orthonormal Wavelet; Wavelets with Compact Support: From Scaling Filter to Scaling Function, Explicit Construction of Compact wavelets, Smoothness	6

	of Wavelets, Shannon Wavelets, Franklin Wavelets.	
8	**Convergence Properties of Wavelet Expansions:** Wavelet Series in L^p Spaces: Large Scale Analysis, Almost-Everywhere Convergence, Convergence at a Preassigned point; Jackson and Bernstein Approximation Theorems.	6

References:

1) M. K. Jain et al., Numerical Methods, New Age Int. Pub., (2009).
2) K. Shankar Rao, Numerical Methods for Scientists & Engineers, PHI Pub., (2011).
3) G. Bachman et. al., Fourier and Wavelet Analysis, Springer Pub., (2009).
4) Y. Nievergelt, Wavelets made easy, Birkhauser Pub., (1999).
5) K. P. Soman and K. I. Ramachandran, Insight into Wavelets From Theory to Practice, PHI Pub. (2010).
6) Mark A. Pinsky, Introduction to Fourier Analysis and Wavelets, Cengage Learning Pub., (2008).
7) D. F. Walnut, An introduction to Wavelet Analysis, Birkhauser Pub., (2009).

Q. P. Pattern:

Total 8 questions. Each carrying 10 marks.
Solve any five (5X10 = 50)
Max. Mark - 50 Marks. 2 Hrs Exam