PROFESSIONAL MATHEMATICS

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Theory</th>
<th>No of Period in one session : 60</th>
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<tbody>
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| Rationale: | A technical diploma holder is engaged generally as first line supervisor. He forms a bridge between workers and management. He has to understand the language of the modern management and communicate with the workers in their language. This subject will help accomplish the task in stipulated time, develop attitude towards cost effectiveness, selection of most effective alternative methods. This course will also help the student to tackle different numerical methods and computational techniques for problem solving in research organization as a programmer. |
| Objectives: | The course enables students to: |
|            | • Managerial skill based on mathematical footing |
|            | • The ability to find approximate solutions and/or answers to the problems where analytical methods become more complex. |
|            | • To choose correct numerical techniques for a given problem. |

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<thead>
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<th>S.No.</th>
<th>Topics</th>
<th>Periods</th>
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<tbody>
<tr>
<td>01</td>
<td>GROUP –A (Numerical Methods &amp; Computational Techniques)</td>
<td>(20)</td>
</tr>
<tr>
<td>02</td>
<td>GROUP-B (Statistical Techniques)</td>
<td>(20)</td>
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<tr>
<td>03</td>
<td>GROUP-C (Management Techniques)</td>
<td>(20)</td>
</tr>
<tr>
<td></td>
<td>Total:</td>
<td>(60)</td>
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<table>
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<tr>
<th>CONTENTS:</th>
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<tbody>
<tr>
<td><strong>GROUP-A</strong> (NUMERICAL METHODS &amp; COMPUTATIONAL TECHNIQUES)</td>
</tr>
<tr>
<td>01.01 Introduction to Numerical methods: Approximation and errors (Truncation &amp; Round off). Floating point presentation of numbers, arithmetic operations with normalized floating point.</td>
</tr>
<tr>
<td>01.03 Solution of Linear Simultaneous Equations: Gaussian Elimination method and Gauss-Jordan method.</td>
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<tr>
<td>01.05 Numerical Differentiation &amp; Integration: Newton’s forward and backward differentiation formula. Trapezoidal Rule and Simpson’s 1/3 rule for numerical integration.</td>
</tr>
<tr>
<td>01.06 Numerical solution of 1st order ordinary differential equations: Taylor’s Series. Euler’s method. Modified Euler’s method Runge-Kutta methods.</td>
</tr>
<tr>
<td><strong>GROUP-B</strong> (STATISTICAL TECHNIQUES)</td>
</tr>
<tr>
<td>02.01 Introduction to statistics: Measure of central tendencies: measures of dispersions: standard deviation and variance for discrete and grouped data: assumed mean and step deviation methods.</td>
</tr>
<tr>
<td>02.03 Probability Distribution: Introduction to Arithmetic Mean and Standard Deviation of a probability distribution. Important probability distribution – Binomial distribution. Poisson’s distribution and normal distribution. Their means and variance.</td>
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<td>02.04 Sampling Distribution: Sampling Distribution of Mean and Standard Deviation.</td>
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<tr>
<td>02.05 Quality Control: P-Chart and R-Chart.</td>
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<tr>
<td><strong>GROUP-C</strong> (MANAGEMENT TECHNIQUES)</td>
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<tr>
<td>03.01 Linear Models</td>
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<tr>
<td>03.01.01 Introduction to Operations Research (O.R) Steps of O.R.</td>
</tr>
<tr>
<td>03.01.02 Linear Programming Problems: Step in information of a LPP. Mathematical Modelling and Solution Procedure.</td>
</tr>
<tr>
<td>03.01.03 Solution by Simplex Method: Basic Feasible Solution (Degenerator and Non-degenerator) Procedure including Big-M Method. Example.</td>
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<tr>
<td>03.01.04 Transportation problem: Introduction and Solution Procedure- (i) Finding the initial basic feasible solution by N-W Corner Rule and Vogel’s Approximation Method. (ii) Finding the Optimal Solution by U-V Method.</td>
</tr>
<tr>
<td>03.01.05 Assignment Problem: Introduction and Solution Procedure–Fundamental theory underlying Hungarian Method.</td>
</tr>
<tr>
<td>03.02 Network Analysis. CPM &amp; PERT: Introduction.</td>
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<tr>
<td>03.02.01 Basic concepts – Activities. Nodes. Edges. Networking of a project. Various times calculations. CPM to determine the optimal project schedule.</td>
</tr>
<tr>
<td>03.02.02 PERT- Definition, difference between CPM &amp; PERT. Pessimistic times, optimistic times. Most likely times of various activities, probability of meeting the schedule time, standard deviation of the schedule time.</td>
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<tr>
<td>03.03 Simulation: Event type simulation – elements of simulation, Generation of random numbers. Monte -O Carlo simulation – Generation and analysis of random observation using random numbers.</td>
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<tr>
<th>Books Recommended: Text Books</th>
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SCHEME OF EXAMINATION FOR FINAL EXAMINATION F.M :80
Rationale:
The subject forms an important part of Engineering curricula for developing the concepts required in the design of various structures. The subject deals with the basic concept of mechanic of body and the behaviour of material used in practice and in structures under varying load conditions. The first part of the subject deals with the applied mechanics science. Which describe the condition of body in rest or motion under the action of forces. In its preview come variety of general and specialized engineering disciplines concerned with analysis of structures and machines and the mechanism of their parts.

In the Second part, the principles of strength of materials is introduced in which the student will learn to distinguish between different types of stress and strain and also the qualitative assessment of stress and strains in material element under the action of internal forces.

Objective:
Knowledge Workers will be able to:
- Analyze and understand the physical behaviour of members of engineering structures.
- Acquire knowledge of various elements of structures.
- Utilise the basic principles.
- Develop skill to tackle field problem.
- Solve the problems by the application of basic principles.
- Judge the suitability of materials in design process.

S.No. Topics

PART-A

01 Introduction (02)
02 Vector Methods (02)
03 Introduction to system of forces and equilibrium (06)
04 Friction (04)
05 Kinematics and kinetics of a particle (03)
06 Kinematics and kinetics of rigid body (04)
07 Impulse and Momentum (02)
08 Work, Energy and Power (04)

Total : (27)

PART-B

01 Simple stress and strains (05)
02 Elastic constants (03)
03 Center of Gravity (Centroid) (05)
04 Moment of Inertia (05)
05 Shearing force and bending moments (05)

Total : (23)

TOTAL : (50)

CONTENTS:

PART-A

TOPIC: 01 – INTRODUCTION:
Idealisation of mechanics; Concept of rigid body; External forces (Body forces & surface forces) Law of Mechanics.

TOPIC: 02 VECTOR METHODS:
Equality and equivalence of vectors; Free and Bound vector; Moment of a force about a point and a line; Couple and moment of a couple; couple moment as free vector. Wrench.

TOPIC: 03 – INTRODUCTION TO SYSTEM OF FORCES AND EQUILIBRIUM:
Statically equivalent force system; simplest equivalent of a system of forces; force analysis, free body diagram, equation of equilibrium.

TOPIC: 04 – FRICTION:
Types of Friction (Static, Dynamic, Sliding, Rolling, Fluid) Rope & Belt Friction etc.

TOPIC: 05 – KINEMATICS AND KINETICS OF A PARTICLE:
Rectilinear and curvilinear translations; normal and tangential component of acceleration; radial and transverse component of acceleration.

TOPIC: 06 – KINEMATICS AND KINETICS OF RIGID BODY:
Angular Velocity and angular acceleration. Effective forces on a rigid body. D’ Alembert’s principle.

TOPIC: 07 – IMPULSE AND MOMENTUM:
Linear impulse and linear momentum, angular impulse and angular momentum.

TOPIC: 08 – WORK, ENERGY AND POWER:
Work done by forces and couples, potential and kinetic energy, work-energy; conservation of energy; concept of power and efficiency.

PART-B

TOPIC: 01 – SIMPLE STRESSES & STRAIN:
01.01 Definition of various terms and their units (S.I. Units)
01.03 Stress & strain in varying sectional bar & composite bar. Stress & strain due to temperature variation in homogeneous and composite bars.
01.04 Shrinking on hoop’s stresses.

TOPIC: 02 – ELASTIC STRESSES & STRAINS:

[03]
02.01 Linear strain and lateral strain, Poisson’s ratio, volumetric strain
02.02 Change in volume due to axial, biaxial & triaxial loading. Bulk modulus.
02.03 Shear stress and strain, modulus of rigidity.
02.04 Various relations between modulus of elasticity, modulus of rigidity & bulk modulus.
02.05 Simple shear. Complementary shear stress, stress on oblique section.

**TOPIC: 03 – CENTER OF GRAVITY (CENTROID):**
- 03.01 Definition of center of gravity & centroid.
- 03.02 Determination of C.G of various sections symmetrical and unsymmetrical sections.
- 03.03 Determination of C.G of perforated sections. C.G of semi circle, quadrant circle.

**TOPIC: 04 – MOMENT OF INERTIA:**
- 04.01 Definition of M.I.; radius of gyration, second moment of area.
- 04.02 Parallel axis theorem & perpendicular axis theorem.
- 04.03 Derivation of M.I of regular area-rectangular, triangular circular about centroidal axis.
- 04.04 M.I. of built up section, symmetrical and unsymmetrical about centroidal axis, modulus of sections.

**TOPIC: 05 – SHEARING FORCE & BENDING MOMENT:**
- 05.01 Types of beams and types of supports, types of loading.
- 05.02 Concept and definitions of shear force and bending moment, sign convention.
- 05.03 Shear force and bending moment diagrams for cantilever, simply supported beam, over hanging beam for various types of loading & couples, point of contraflexure.
- 05.04 Relation between B.M, S.F. and rate of loading.

**Books Recommended:**

**Text Books**

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**SCHEME OF EXAMINATION FOR FINAL EXAMINATION**

F.M. : 80
Rationale:
Computers play a vital role in present day life, more so, in the professional life of technician engineers. In order to enable the students use the computers effectively in problem solving, this course offers the modern programming language C along with exposition to various engineering applications of computers.

Objective:
The objectives of this course are to make the students able to:
- Develop efficient algorithms for solving a problem.
- Use the various constructs of a programming language viz. conditional, iteration and recursion.
- Implement the algorithms in “C” language.
- Use simple data structures like arrays, stacks and linked list solving problems.
- Handling File in “C”.

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<thead>
<tr>
<th>S.No.</th>
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<th>Periods</th>
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<tbody>
<tr>
<td>01</td>
<td>Introduction to Programming</td>
<td>(03)</td>
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<tr>
<td>02</td>
<td>Algorithm for Problem Solving</td>
<td>(08)</td>
</tr>
<tr>
<td>03</td>
<td>Introduction to ‘C’ Language</td>
<td>(06)</td>
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<tr>
<td>04</td>
<td>Condition and Loops</td>
<td>(06)</td>
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<td>05</td>
<td>Arrays</td>
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<td>06</td>
<td>Functions</td>
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<td>07</td>
<td>Structures and Unions</td>
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<td>08</td>
<td>Pointers</td>
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<td>09</td>
<td>Self Referential Structures and Linked Lists</td>
<td>(03)</td>
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<tr>
<td>10</td>
<td>File Processing</td>
<td>(03)</td>
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Total (50)

CONTENTS:

TOPIC: 01 – INTRODUCTION TO PROGRAMMING:

TOPIC: 02 – ALGORITHM FOR PROBLEM SOLVING:
Exchanging values of two variables, summation of a set of numbers. Decimal Base to Binary Base conversion. Reversing digits of an integer, GCD (Greatest Common Division) of two numbers. Test whether a number is prime. Organize numbers in ascending order. Find square root of a number, factorial computation, Fibonacci sequence. Evaluate ‘sin x’ as sum of a series. Compute sine Series. Check whether a given number is Palindrome or not. Find Square root of a quadratic equation. Generate LCM & GCD. Reverse order of elements of an array. Find largest number in an array. Print elements of upper triangular matrix, multiplication of two matrices, Evaluate a Polynomial.

TOPIC: 03 – INTRODUCTION TO ‘C’ LANGUAGE:
03.01 Character set, Variable and Identifiers, Built-in Data Types, Variable Definition, Declaration, C Key Words-Rules & Guidelines for Naming Variables.
03.02 Arithmetic operators and Expressions, Constants and Literals, Precedence & Order of Evaluation.
03.03 Simple assignment statement. Basic input/output statement.
03.04 Simple ‘C’ programs.

TOPIC: 04 – CONDITIONAL STATEMENTS AND LOOPS:
04.01 Decision making within a program
04.02 Conditions, Relational Operators, Logical Perator.
04.03 If statement, it-else statement.
04.04 Loop statements
04.05 Break, Continue, Switch, Goto and Labels.

TOPIC: 05 – ARRAYS:
What is an Array?, Declaring an Array, Initializing an Array.
One dimensional arrays: Array manipulation: Searching, Insertion, Deletion of an element from an array; Finding the largest/smallest element in array;
Two dimensional arrays, Addition/Multiplication of two matrices, Transpose of a square matrix; Null terminated strings as array of characters, Representation sparse matrices.

TOPIC: 06 – FUNCTIONS:
Top-down approach of problem solving. Modular programming and functions, Definition of Functions Recursion, Standard Library of C functions, Prototype of a function: Formal parameter list, Return Type, Function call, Block structure, Passing arguments to a Function: call by reference; call by value, Recursive Functions, arrays as function arguments.

TOPIC: 07 – STRUCTURES AND UNIONS:

TOPIC: 08 – POINTERS:
Concept of Pointers, Address operators, pointer type declaration, pointer assignment, pointer initialization pointer arithmetic, Indirection Operator, Pointers to Pointers, functions and pointers, Arrays and Pointers, pointer arrays.
TOPIC: 09 – SELF REFERENTIAL STRUCTURES AND LINKED LISTS:
Creation of a singly linked list, Traversing a linked list, Insertion into a link list, Deletion from a linked list.

TOPIC: 10 – FILE PROCESSING:
Concept of Files, File operation in various modes and closing of a file, Reading from file, Writing onto a file.

Book Recommended:


SCHEME OF EXAMINATION FOR FINAL EXAMINATION        F.M. : 80
TEXTILE FIBRES AND TEXTILE TECHNOLOGY

<table>
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<th>Subject Code</th>
<th>Theory</th>
<th>No of Period in one session : 50</th>
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<tr>
<td>18204</td>
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<td>No of Periods Per Week Full Marks : L T P/S Annual Exam. :</td>
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S.No. | No. | Periods |
---|---|---|
01. | Introduction to Textile | (02) |
02. | Properties of Textile | (02) |
03. | Natural Fibres | (15) |
04. | Man – made Fibres | (18) |
05. | Comparison of Man –made Fibres with Natural Fibres | (02) |
06. | Identification and Application of Textile Fibres | (05) |
07. | Selection of Fibres | (03) |
08. | Care and Storage of Fabrics | (03) |

CONTENTS:

**TOPIC: 01- INTRODUCTION TO TEXTILE:**

01.01 Textile, textile technology, textile engineering, texture and importance of textile
01.02 Textile filament (definition with examples).
01.03 Classification of textile fibres according to source of occurrence.
01.04 Different fibres and their uses in textile industry.

**TOPIC: 02- PROPERTIES OF TEXTILE:**

02.01 Fiber morphology. The macro and micro structure of a textile fibre and filament, microscopic appearance.
02.02 Important Physical Properties of Textile Fibres: stable length, strength, elasticity, uniformity, cohesiveness or spinnability, softness and fineness, resiliency, flexibility, pliability, plasticity, luster, absorbency, density and specific gravity, co lour, abrasion resistance etc.
02.03 Thermal Properties: Effect of heat and flammability.
02.04 Chemical Properties: Resistance to acids, alkalies, sunlight, effect of bleaches.
02.05 Biological Properties (such as resistance to micro-organism, mildew, rots, insects). Influence on skin contact confort.
02.06 Electrical Properties and others: Static Electricity resistance etc.

**TOPIC: 03- NATURAL FIBRES:**

03.01 Cotton Fibres
03.01.01 Introduction and History
03.01.02 Growth, cultivation and production of cotton fibres, grading and growing countries, commercial classification or varieties of cotton (Sea- Island, Egyptian, Brazilian, American and Indian cotton etc.).
03.01.03 Microscopic Appearance and chemical composition of cotton.
03.01.04 Physical Properties: Convolutions, length tensile strength, flexibility, luster, moisture absorption colour, density, elongation, modulus etc.
03.01.05 Chemical Properties: Action of acid, alkalies, organic solvent & water.
03.01.06 Thermal Properties. Biological Properties (mildew, insect, rots tec.)
03.01.07 Uses of Cotton fibres.
03.02 Wool Fibres
03.02.01 Introduction and History.
03.02.02 Growing of wool, grading of wool (fine, medium, long, crossbred, mixed).
03.02.03 Types of wool (Merino, British, Cross- breed, carpet).
03.02.04 Microscopic structure and appearance, chemical composition.
03.02.05 Physical Properties: Length, Fineness, Strength, Elasticity, Resilience, Moisture absorption, Dimensional Stability, Crimp, Specific Gravity, Colour, Capillarity and Porosity, Luster, Thermal properties and Electrical properties.
03.02.06 Chemical Properties: Action of Acids, Alkalies, Effect of bleaches etc: influence of mildew, moth and bacteria.
03.02.07 Felting of wool.
03.02.08 Brief idea of conversion of wool fibers into woolens and worsted yarns.
03.02.09 Uses.
03.03 Silk
03.03.01 Introduction and History.
03.03.02 Types of silk (Mulberry, Tassar, Eri and Muga silk).
03.03.03 Production of silk.
03.03.03.01 Sericulture
03.03.03.02 Reeling of silk
03.03.03.03 Throwing of silk
03.03.03.04 Wild silk, spun silk
03.03.05 Chemical composition of silk, degumming of silk.
03.03.06 Physical Properties of silk, Length and denier, tensile strength and tenacity, density and specific gravity, elasticity, luster, resilience, moisture regain absorbency, colour, dimensional stability, electric properties.
03.03.07 Chemical Properties: Action of heat, sunlight, water, acids, alkalis, chloride salts, organic solvent, bleaches, dyeing properties.
03.03.08 Microscopic appearance. uses of silk.
03.04 Jute Fiber
03.04.01 Introduction and History.
03.04.02 Growth and cultivation: Harvesting. Retting and stripping of jute fibers.
03.04.03 Properties and Uses of jute fibers.
03.04.04 Jute Spinning.
03.05 Flax
03.05.01 Introduction
03.05.02 Cultivation, retting and extraction.
03.05.03 Properties and uses of Flax fibers.
TOPIC: 04 - MAN - MADE FIBERS:

04.01 Viscose Rayon
04.01.01 Manufacture with flow sheet.
04.01.02 Manufactures (name and definition only)
04.01.03 Chemical Properties (reaction with inorganic acids, alkalies and organic solvents).
04.01.04 Uses.
04.02 Polynosic Rayon
04.02.01 Introduction. Manufacture and properties.
04.03 Cuprammonium Rayon
04.03.01 Introduction and chemical constitution.
04.03.02 Manufacture with flow sheet.
04.03.03 Properties and uses.
04.04 Acetate Rayon
04.04.01 Introduction
04.04.02 Manufacture with flow chart (in brief)
04.04.03 Physical and Chemical Properties (in brief) and uses.
04.05 Synthetic Fibers
04.05.01 Polyamide fibers
04.05.01.01 Manufacture of Nylon 6 and Nylon 66 with flow sheet.
04.05.01.02 Physical Properties of Nylon 6.66 (name & definition only).
04.05.01.03 Chemical Properties of Nylon 6.66 (reaction with inorganic acids, alkalies) and uses.
04.05.02 Polyester fibers
04.05.02.01 Introduction
04.05.02.02 Manufacture with flow sheet.
04.05.02.03 Physical Properties (name & definition only).
04.05.02.04 Chemical Properties (reaction with inorganic acids, alkalies).
04.05.02.05 Uses.
04.05.03 Acrylic fibers
04.05.03.01 Introduction
04.05.03.02 Manufacture with flow sheet.
04.05.03.03 Properties and uses.
04.05.03.04 Introduction of Elastomeric fibers (spandex). Polyolefin fibers, Nomex fibers. Kevlar fibers, Inorganic fibers.
04.06 Types of Spinning
04.06.01 Brief Idea about man-made spinning: Melt spinning. Dry spinning and Wet spinning.

TOPIC: 05 - COMPARISON OF MAN-MADE FIBRES WITH NATURAL FIBRES:

05.01 Comparison of man-made fibers with natural fibers (regarding staple length, fineness, strength, elasticity, moisture absorption, electrical properties etc).

TOPIC: 06 - IDENTIFICATION AND APPLICATION OF TEXTILE FIBRES:

06.01 Introduction of textile fibers.
06.01.01 Non-Technical: Test: Feeling test. Burning test, Staining test.
06.01.02 Technical Test: Microscope test. Density measurement, Chemical test.
06.02 Application of Fibers and Textiles: Apparel textiles, bedding and home textiles and technical textiles.
06.02.01 Technical textiles
06.02.01.01 Mobile textiles
06.02.01.02 Geo textiles
06.02.01.03 Construction textiles
06.02.01.04 Industrial textiles
06.02.01.05 Medical textiles
06.02.01.06 Safety textiles

TOPIC: 07 - SELECTION OF FABRICS:

07.01 Introduction
07.02 Base of Selection
07.03 Selection of Bedding and home textiles and Interior textiles.
07.04 Selection of Apparel textiles.
07.05 Readymade Garments: Introduction, Base of selection (quality, colour, designs, cutting, sewing and assembling, hemming, fastners (), decoration and trimmings etc.), style & fashion, comfortable, fit, suit and appearance, longer wearability, cleaning & washing, care and storage, free-size clothing.

TOPIC: 08 - CARE AND STORAGE OF FABRICS:

08.01 Care and Storage of Fabrics: Brushing and Airing. Clean storage, Immediate repairing, Stain-removal. Frequent laundering. Appropriate laundering procedure, intelligent choice of cleaning materials, Appropriate drying. Proper pressing and ironing, the way you use it, the way you keep after use.

Book Recommended:

01. Textiles Fibers. - Dr. V.A. Shenai
02. Textiles Fibers. - Mathew
03. Introduction to Textiles Fibers. - Murthy
04. Man-Made fibers. - R.W. Moncrieff
05. Textiles Fibers. - ATA
06. Textiles Science. - Gohl
07. A Textiles Book of Fiber Science and Technology - S.P. Mishra
08. Textiles Fibers to Fabric - Carbman
09. Fabric Care - D’Souza
10. Essential of Textiles - Joseph
11. Textile Fibres and Their Use - Hess

SCHEME OF EXAMINATION FOR FINAL EXAMINATION F.M.:80
YARN MANUFACTURE - I

<table>
<thead>
<tr>
<th>Subject Code</th>
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<tbody>
<tr>
<td>Theory</td>
<td>No of Period in one session : 50</td>
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<td>No of Periods Per Week</td>
<td>Full Marks : 100</td>
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CONTENTS:

S.No. | Topics | Periods
--- | --- | ---
01 | Ginning and Baling | (03)
02 | Mixing and Blending | (03)
03 | Blow Room | (250)
04 | Carding | (08)
05 | Draw Frame | (07)
06 | Combing | (04)

TOPIC: 01 - GINNING AND BALING

01.01 | Objects of Ginning | [03]
01.02 | Lents and Linters | [03]
01.03 | Different types of Ginning Machine (Description and Working). | [03]
01.03.01 | Macarthy Roller Gin | [03]
01.03.02 | Saw Gin | [03]
01.03.03 | Knife Roller Gin | [03]
01.04 | Defects in ginning of cotton. | [03]
01.05 | Importance of proper ginning. | [03]
01.06 | Objects of baling | [03]
01.07 | Different types of baling. | [03]
01.08 | Forms of cotton bale. | [03]

TOPIC: 02 - MIXING AND BLENDING:

02.01 | Definition and objects: difference between mixing and blending. | [03]
02.02 | Selection of fibres. | [03]
02.03 | Types of mixing: Stack mixing. | [03]
02.04 | Places of mixing: Blow-room mixing, carding, Draw frame mixing and blending. | [03]
02.05 | Condition of bale cotton. | [03]
02.06 | Mixing Bale Opener (MBO) | [03]
02.07 | Uses of Anti-Static Reagent in mixing. | [03]
02.08 | Tinting of the fibres in mixing. | [03]
02.09 | Importance of mixing and blending. | [03]

TOPIC: 03 - BLOW ROOM:

03.01 | Objects | [25]
03.02 | Principle of Opening and Cleaning. | [25]
03.03 | Blow Room Machines (Description and working) | [25]
03.03.01 | Hopper Bale Breaker and Hopper. | [25]
03.03.02 | Types of conventional openers, cleaners and beaters: Vertical opener. Porcupine opener, two and three bladed beater, Kirschner beater. | [25]
03.03.03 | Improved openers: cleaners and beaters: Twin opener, Step cleaner (or ultra cleaner). S.R.R.L. opener, Air jet cleaner, (or Air stream cleaner), Shirley opener. | [25]
03.03.04 | Recent developments in beaters, openers and cleaners: Porcupine beater. Airflow cleaner Spiro leaner, Mono cylinder cleaner, ERM cleaner, cleaner R.K. | [25]
03.04 | Lap Forming /Chute Feed System | [25]
03.04.01 | Detail study of conventional scutcher | [25]
03.04.01.01 | Principle and Working of Piano Feed Regulation. | [25]
03.04.01.02 | Principle of Cone Drum. Designing of Cone Drum and Use of Cone Drum. | [25]
03.04.01.03 | Lap Forming Unit. | [25]
03.04.01.04 | Doffing Mechanism. | [25]
03.04.02 | Automatic Modern Scutcher:(details) | [25]
03.04.02.01 | Trutzchler Automatic Scutcher: (Condenser, Pneuma feeder, beater section and lap formation. | [25]
03.04.02.02 | Hergeth’s Automatic Scuteher. | [25]
03.05 | Ancillary Equipments: | [25]
03.05.01 | Cotton conveying: Lattice conveying & pneumatic conveying. | [25]
03.05.02 | Delivery cages, condenser, filters and dust trunk, grid bars and leaf, safety devices micro, micro-dust separators, gravity traps etc. | [25]
03.06 | Major and minor cleaning point. | [25]
03.07 | Beating points and cleaning efficiency blow room waste. | [25]
03.08 | Modern blow room | [25]
03.08.01 | Types of modern blenders: Fibre meter. diesel blenders, auto mixer, karasousel, trutzschler multimixer, aero mix. | [25]
03.08.02 | Study of bale pluckers | [25]
03.08.02.01 | Blendomat – BDT – M.S Trutzschler (Programmabale bale opener). | [25]
03.08.02.02 | Blending Grab MG 30- M.S Ingolstandt. | [25]
03.08.02.03 | Uni –Floc Bale opener – M.S Reiter. | [25]
03.09 | Difference between modern and conventional blow room. | [25]
03.10 | Brief idea about the selection of blow room line (or machinery) for various types cotton, P/V. P/C blends etc. Modern blow room line. | [25]
03.11 | Calculation regarding speed, production, efficiency, waste extraction, hank of lap etc. | [25]
03.12 | Process parameters, quality norms, laps defects and characteristics of good lap. | [25]
TOPIC: 04- CARDING:
04.01 Principles and objects of Carding.
04.02 Detail study of Revolving Flat Card.
04.03 Constructional features and working details of Licker-in cylinders, flats, doffers, feed roller, mote knives, Licker-in undercasting, back plate, cylinder-undercasting, front plate, doffer comb, trumpet, calendar roller and coiler roller.
04.04 Setting of the various parts of the card.
04.05 Card stripping
04.05.01 Roller stripping
04.05.02 Vacuum stripping
04.05.03 Continuous stripping
04.06 Card Grinding
04.06.01 Long roller grinding
04.06.02 Traverse grinding
04.07 Card clothing
04.07.01 Metallic clothing, clothing with metallic wires, advantages and disadvantages of metallic clothing.
04.07.02 Flexible clothing - Foundation, wire clothing construction, types of card clothing, setting of card clothing.
04.07.03 Comparison of flexible-wire and metallic- wire card clothing.
04.08 Study of semi high speed and high speed cards and their comparison.
04.09 Card waste and its control, importance of proper carding.
04.10 Cleaning efficiency
04.11 Doffing device
04.12 Quality control in carding, process parameters.
04.13 Chute Feed System
04.14 Fiber loading on wire surface of card, Card sliver defects.
04.15 Calculation regarding speeds, drafts, production, waste percentage, hank of slivers etc.
04.16 Productivity and modernization of card, Tandem card.
04.17 Effect of poor carding performance.

TOPIC : 05- DRAW FRAME:
05.01 Principles and objects
05.02 Construction and Working of conventional draw frame (detail).
05.03 Drafting system
05.03.01 Grafting system
05.03.02 Shierley drafting system
05.04 Principle of roller slip and its remedies.
05.05 Roller slip and its remedies.
05.06 Roller weighting
05.06.01 Dead weighting
05.06.02 Self weighting
05.06.03 Spring weighting
05.06.04 Pneumatic weighting
05.06.05 Magnetic weighting
05.07 Roller settings
05.08 Can Motion
05.09 Improved drafting system
05.09.01 The 3-over-3system
05.09.02 The 2-over-3system
05.09.03 The Platt Pressure-bar system
05.09.04 The S.A.C.M. 4-over-4system
05.09.05 The Whitin 4-over-4system
05.09.06 The Saco- Lowell 3-over-4 (shaw) system
05.09.07 The Rierter 3 – over -4(shaw) system
05.10 Novel Features of Modern Draw Frames.
05.10.01 Rieter Draw Frame
05.10.02 S.A.C.M. Draw Frame
05.10.03 Saco- Lowell, Versa-Matic Draw Frame
05.10.04 Zinser Draw Frame
05.11 Salient Features of Modern Draw Frame
05.12 The Saco-Lowell- Uster Versa-Matic ADC Draw Frame
05.13 Stop Motion Tension draft, Auto- levelers and their performance.
05.14 Sliver irregularity and process control in draw frame.
05.15 Calculation regarding speed, draft and production.

TOPIC: 06 – COMBING:
06.01 Objects
06.02 Preparation of the material for combing
06.02.01 Sliver-Lap Machine
06.02.02 Rebon –Lap Machine
06.02.03 Super –Lap Machine
06.03 Salient features of modern lap preparation system.
06.04 Lakshmi Rieter’s Sliver-Lap/ Ribbon Lap system
06.05 Lap Former
06.06 Effects of Hooks on Comber lap preparation.
06.07 Presence of long fibres in the waste.
### Books Recommended:

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<td>Cotton Spinning Combined</td>
<td>Taggart</td>
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<td>Essential Elements of Practical Cotton Spinning</td>
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<td>03</td>
<td>Cotton Opening and Picking</td>
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<td>Merrill</td>
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<td>05</td>
<td>Cotton Drawing and Roving</td>
<td>Merrill</td>
</tr>
<tr>
<td>06</td>
<td>Cotton Combing</td>
<td>Merrill</td>
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<tr>
<td>07</td>
<td>Spun Yarn Technology, Volume-I.II.III</td>
<td>V. Subramaniam</td>
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<td>08</td>
<td>Manual of Cotton Spinning, Volume I.IV</td>
<td>Textile Institute</td>
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<tr>
<td>09</td>
<td>The Technology of Short Staple Spinning (Series)</td>
<td>Klein (TIM)</td>
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<td>10</td>
<td>Spun Yarn Technology</td>
<td>Eric Oxtoby</td>
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<td>11</td>
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<td>Taggart</td>
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<td>12</td>
<td>Essential Calculations of Practical Cotton Spinning</td>
<td>Pattabhiram</td>
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<td>13</td>
<td>Spinning Calculation</td>
<td>Shree Nivasan Murthy</td>
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### SCHEME OF EXAMINATION FOR FINAL EXAMINATION

F.M. : 80
YARN PREPARATION & WEAVING CALCULATION - I

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02.   | Winding                           | (22)
03.   | Pirn Winding                      | (09)
04.   | Yarn Count Calculations           | (14)
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TOPIC: 01- INTRODUCTION:
01.01 Various systems of yarn preparation and their functions- Winding, Warping, Sizing, Beaming, Looming
01.02 Forms of yarn available to manufacturers
01.03 Brief idea about different process for bleached, mono-coloured and multi-coloured warps weft.

TOPIC: 02-WINDING:
02.01 Objects and types of wining
02.02 Slow Speed Winding
02.02.01 Upright spindle winding machine and its drive, traverse motion.
02.02.02 Cam and Mangle Wheel mechanism
02.02.03 Merits and demerits of upright spindle winding machine
02.02.04 Drum winding machine and its mechanism
02.03 Modern upright spindle winding machine
02.04 High Speed Winding
02.05 Super speed winding
02.06 Automatic Cone and Cheese winding
02.07 Mechanism and motions used in cone and cheese winding
02.07.01 Creel
02.07.02 Baloon Breaker
02.07.03 Tensioners
02.07.03.01 Washer type tensioners
02.07.03.02 Spinning disc type tensioners
02.07.03.03 Gate type tensioners
02.07.03.04 Compensating type tensioners
02.07.04 Clearers and slub catchers
02.07.05 Ribbon breaker
02.07.06 Traverse motion
02.07.07 Cone winding shaft or drum
02.07.08 Cone or cheese holders
02.07.09 Automatic thread stop motion
02.07.10 Full bobbin stop motion
02.07.11 Drive
02.08 High Speed Winding Machines
02.08.01 Schafhorst high speed cheese winding machine
02.08.02 Roto-coner high speed cheese winding machine
02.08.03 Aito-coner high speed cheese winding machine
02.08.04 Uni-coner high speed cheese winding machine
02.08.05 Mach-coner high speed cheese winding machine
02.08.06 Precision cone and cheese winding
02.08.07 Merits and demerits of high speed and super winding
02.08.08 Schweiter High speed winding machine
02.09 Automatic cone and cheese winding
02.09.01 Barber coloman automatic spooler winder
02.09.02 Advantages and disadvantages of Barber coloman spooler winder.
02.09.03 TFO
02.10 Winding faults and remedies
02.11 Control of package faults.

TOPIC: 03 - PIRN WINDING:
03.01 Objects of pirn winding
03.02 Ordinary pirn winding
03.02.01 Merits and demerits of ordinary pirn winding
03.03 High speed pirn winding
03.04 Super speed pirn winding
03.05 Automatic pirn winding
03.06 Fully automatic pirn winding
03.07 Schweiter high speed pirn winding machine
03.08 Hocoba high speed pirn winding machine
03.09 Schweiter Automatic pirn winding machine
TOPIC : 04- YARN COUNT CALCULATIONS:

04.01 Yarn counts- Definition with examples
04.02 Numbering System: Indirect, Direct and Universal System with examples.
04.03 Conversion from one system to another system in the indirect system
04.04 Conversion from one system to another system in the direct system
04.05 Conversion from the indirect system to direct system and vice versa.
04.06 Folded yarns
04.06.01 Resultant counts
04.06.02 Costing of folded yarns
04.07 Conditioned count
04.08 Average counts
04.09 Reed and Reed calculations
04.09.01 Definition of reed
04.09.02 System of counting reed
04.09.02.01 System based on the number of dents in a given space (stockpart, Radcliff, huddersfield.)
04.09.02.02 System based on the number of groups in a given space (Bolton, Bradford, Blackburn, Irish etc.)
04.09.02.03 Conversion from one system to another.
04.10 Heald counts
04.10.01 Counting of healds – definition
04.10.02 Problems

Book Recommended:

02. Weaving Calculation - R. Sen Gupta
03. Yarn Winding - P.K. Banerjee
04. Winding - BTRA
05. Yarn Preparation. Volume I&II - J.T. Marsh
06. Modern Weaving Calculations.Vol-I - Singh
07. TFO- Technology and Techniques - Shree Nivasan Murthy

SCHEME OF EXAMINATION FOR FINAL EXAMINATION

F.M. : 80
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<td>Weft Fork Motion</td>
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**TOPIC: 01- MOTION OF WEAVING:**
01.01 Principle and definition of fabric manufacture.
01.02 Motions in weaving
01.02.01 Primary motions
01.02.02 Secondary motions
01.02.03 Tertiary motions

**TOPIC: 02- LOOM:**
02.01 Introduction
02.02 Types of Loom
02.02.01 Handloom – default study of plain tappet looms.
02.02.02 Powerloom - default study of plain tappet looms
02.03 Various parts of loom and its functions.
02.04 Healds – Necessity of healds and types of healds.

**TOPIC: 03- SGEEDBG MECHANISMS:**
03.01 Definition
03.02 Types of shed
03.02.01 Closed shed
03.02.01.01 Bottom –closed shed
03.02.01.02 Centre- closed shed
03.02.02 Open shed
03.02.02.01 Semi open shed
03.03 Merits, demerits and uses of each type of shed.
03.04 Shedding mechanisms and its kinds
03.04.01 Tappet shedding mechanism
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03.04.03 Jacquard shedding mechanism
03.05 The scope of tappet, doby and jacquard shedding

**TOPIC: 04- TAPPET SHEDDING MECHANISMS:**
04.01 Tappets, cam and difference between cam and tappets.
04.02 Types of tappet shedding
04.02.01 Negative tappet shedding
04.02.02 Positive tappet shedding
04.03 Various types of tappet shedding
04.03.01 Inside tappet shedding
04.03.02 Outside tappet shedding
04.04 Construction of cam and tappets for plain looms.
04.05 Condition of good shedding
04.06 Early shedding and late shedding

**TOPIC: 05- PICKING MECHANISM:**
05.01 Methods of picking
05.02 Types of picking mechanism
05.02.01 Introduction
05.02.02 Principles of spring pick
05.02.03 Principles of Torsion – Picking
05.02.04 Weft control in the multiple – gripper weaving machine.
05.03 Conventional picking mechanism
05.03.01 Introduction
05.03.02 The cone –over pick mechanism
05.03.03 The cone – under pick mechanism
05.03.04 Other conventional picking mechanism
05.04 Shuttle – checking devices
05.04.01 Conventional shuttle looms
05.04.02 Multiple – gripper weaving machines
05.05 Shuttle and its types
05.06 Defects in shuttle and shuttle cop
05.07 Defects in negative picking
05.08 Essential feature to a good pick
05.09 Comparison between under pick and over pick
05.10 Early and Late picking
05.11 Study of the following: Picker, picking Band, Buffer, Check, Strap, Swell spring, Shuttle Guard, Shuttle flying, Shuttle trapping.

**TOPIC: 06- BEATING UP:**

06.01 Introduction
06.02 Construction and Mechanism
06.03 Eccentricity of primary motions in tappet loom.
06.04 Factors affecting the sley, motion.

**TOPIC: 07- TIMING AND SETTING:**

07.01 A Method of indication loom-timing
07.02 Timing of take up motion
07.03 Setting sley, shedding and picking

**TOPIC: 08- TAKE UOP MOTION:**

08.01 Introduction
08.02 Classification of take up motion
08.02.01 Negative and positive take up motion
08.03 Five wheel take up motion
08.04 Seven wheel take up motion
08.05 Dividend of loom
08.06 Calculated dividend and practical dividend
08.07 Calculated regarding dividends
08.08 Changing the number of pick inch

**TOPIC: 09- LET- OFF MOTION:**

09.01 Objects
09.02 Types of let-off motion
09.02.01 Negative let-off motion
09.02.02 Positive let-off motion
09.03 Types of negative let-off motion
09.03.01 Fictional let-off motion
09.03.02 Chain, lever and weight let-off motion
09.04 Advantages and disadvantages of chain, lever and weight let-off motion
09.04 Conditions to good let-off motion

**TOPIC: 10- WET-OFF MOTION:**

10.01 Objects and principles
10.02 Types of Weft fork motion
10.02.01 Side Weft fork motion
10.02.02 Side Weft fork motion
10.02.03 Relative advantages and disadvantages a single Weft fork and a centre wert fork motion
10.03 Timing of side weft fork motion

**TOPIC: 11- WARP PROTECTING MOTION:**

11.01 Introduction
11.02 Types of Warp Protecting motion
11.02.01 Loose Reed Warp Protecting motion
11.02.02 Fast Reed Warp Protecting motion
11.02.03 Electromagnetic Warp Protecting motion
11.03 Loom Knocking off or Banging off
11.03.01 Defects of Knocking off

**Book Recommended:**

01. Weaving Mechanism. Vol. I.II. - N.N. Banerjee
02. The Mechanism of weaving - Fox
03. Principles of weaving - Robinson and Marks
04. Cotton Weaving and Designing - J.B. Taylor
05. Cotton Yarn Weaving - A.T.A.
06. Tappet and Dobby Looms - T. Robberts
07. Weaving, Machines, Mechanisms, Management - Talukdar
08. Weaving Technology - Kulkarni

**SCHEME OF EXAMINATION FOR FINAL EXAMINATION**

F.M. : 80
FABRIC STRUCTURE AND DESIGN

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S.No.           | Topics                                      | Periods |
01.             | Elements of Woven Design                    | (07)    |
02.             | Construction of Elementary                  | (06)    |
03.             | Development of Weaves from Elementary Bases | (14)    |
04.             | Diamond and Diaper Designs                  | (05)    |
05.             | Simple Fancy Weaves                         | (14)    |
06.             | Yarn Diameter and Cover Factor              | (05)    |
07.             | Colour and Its Applications                 | (09)    |

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01.01          | General Principle of fabric structure and design | [07]
01.02          | Classification of woven fabrics                |
01.03          | Methods of fabric representation               |
01.04          | Use of the design                              |
01.05          | Repeat of the design                           |
01.06          | Drawing-in denting, draft, lifting plan, design |
01.07          | System of drafting                             |
01.08          | Construction of drafts and lifting plans       |
01.08.01       | Methods of indicating drafts and lifting plans |
01.08.01.01    | By ruling lines                                |
01.08.01.02    | By design papers                               |
01.08.01.03    | By numbering                                   |
01.08.02       | Relations between weaves                      |
01.08.03       | Construction of drafts and lifting plan from given designs |
01.08.04       | Construction of drafts and lifting plan from given designs |
01.08.05       | Construction of designs from given drafts and lifting plans |

TOPIC : 02- CONSTRUCTION OF ELEMENTARY WEAVES:
02.01          | Study of plain weaves                         | [06]
02.02          | Classification of plain weave                 |
02.03          | Simple twill weaves and its construction       |
02.04          | Sateen and satin weaves                       |
02.04.01       | Regular sateens and satins                    |
02.04.02       | Irregular sateens and satins                  |

TOPIC :03- DEVELOPMENT OF WEAVES FROM ELEMENTARY BASES:
03.01          | Plain weave derivatives                       | [14]
03.01.01       | Warp rib weaves                               |
03.01.02       | Weft rib weaves                               |
03.01.03       | Hop sack, mat or basket weaves                |
03.01.04       | Mock rib effects                              |
03.02          | Weaves constructed on basket weaves           |
03.02.01       | Zig-zag twills                                |
03.02.02       | Herringbone twills                            |
03.02.03       | Broken twills                                 |
03.02.04       | Elongated twills                              |
03.02.05       | Combined twills                               |
03.02.06       | Fancy twills (large diagonals, shaded twills, diagonals on sateen bases, figured twills) |
03.03          | Angle of twills                               |
03.04          | Weaves constructed on satin of sateen bases    |
03.04.01       | Simple developments                           |
03.04.02       | Extension of sateen weaves                    |

TOPIC : 04 - DIAMOND AND DIAPER DESIGNS:
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04.02          | Construction of diaper designs                |
04.03          | Elongated and Flattened diamonds and diapies  |

TOPIC : 05- SIMPLE FANCY WEAVES:
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05.02          | Types of honey comb weaves                    |
05.02.01       | Ordinary honey comb weaves                    |
05.02.02       | Brighton honey comb weaves                    |
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05.04          | Mock Leno Weaves                              |
05.05          | Simple spot designs                           |
05.06          | Crepe weaves                                  |
05.07          | Moss crepes                                   |
05.08          | Fancy rib and cord weaves                     |
05.09          | Bedford cords                                 |
05.09.01 Wadded bedford cords
05.09.02 Crepon bedford cords
05.09.03 Bedford cords, arranged with alternate picks
05.09.04 Twill-faced Bedford cords
05.10 Welts and piques
05.10.01 Ordinary welt structures
05.10.02 Weft wadded wefts
05.10.03 Fast-back wefts
05.10.04 Pique, piques weaves with wadded ends
05.10.05 Waved piques
05.11 Stripe and check weave combinations

**TOPIC: 06- YARN DIAMETERS AND COVERFACTOR:**

06.01 Diameter of yarn and their calculations regarding their in fabric
06.02 Brief idea of structure of cover factor of simple fabrics
06.03 Quality particulars of different fabrics of the above weave.

**TOPIC: 07- COLOUR AND ITS APPLICATION:**

07.01 Light and colour phenomena
07.01.01 Physical baiss of colour
07.01.02 Emission and absorption of light
07.01.03 Colour vision and light theory of colour
07.01.04 Primary, secondary and tertiary colours
07.01.05 Complementary colour
07.01.06 Chroma measurement
07.01.07 Colour measurement
07.01.08 Pigment theory of colour
07.01.09 Modification of colours
07.02 Colours in combination
07.02.01 Colour contrast
07.02.02 Contrast of hue
07.02.03 Contrast of tone
07.02.04 Colour harmony
07.03 Colour Mixing: The rainbow, additive colour mixing, subtractive colour mixing.
07.04 Colour specification and colour specifying systems
07.04.01 The Munsell system
07.04.01.01 Munsell value
07.04.01.02 Munsell hue
07.04.01.03 Munsell chroma
07.04.01.04 Munsell colour charts
07.04.02 The CIE system
07.04.05 Application of colour:
Mixed colour effects, fibre mixtures, twist yarn mixtures, combinations of differently coloured threads, colour stripes and checks,
simple regular patterns, simple irregular patterns, compound orders of colouring etc.

**Book Recommended:**

01. Watson’s Textile Design and Colour - Z. Grosicki
02. Cloth Construction - Robinson and Marks
03. Grammar of Textile Design - Nisbet
04. Structure Fabric Design - Kibbe
05. Textile Colour Mixing - Paterson

**SCHEME OF EXAMINATION FOR FINAL EXAMINATION**

F.M. : 80
TEXTILE TESTING

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- 01.01 The objectives of testing
- 01.02 Importance of testing quality control

**TOPIC: 02- THE SELECTION OF SAMPLES:**
- 02.01 The selection of samples for testing
- 02.01.01 The Random Sample
- 02.01.02 The Biased Sample
- 02.02 Methods of sampling for testing
- 02.02.01 Sampling by ISI Method
- 02.02.02 Sampling by B.S.I. Method
- 02.03 Determination of Fiber length
- 02.03.01 Halo Method
- 02.03.02 Butterfly Method
- 02.04 Determination of Fiber-Length (Silver form)
- 02.04.01 Squaring Technique
- 02.04.02 Cut Squaring Technique
- 02.05 Yarn Sampling Methods
- 02.05.01 The use of Random Numbers
- 02.05.02 Examples of Sampling Methods for Yarns (Yarn Count, Twist in yarn, Lea Strength, Single thread strength test)
- 02.06 Fabric Sampling Methods

**TOPIC: 03- MOISTURE RELATIONS AND TESTING:**
- 03.01 Introduction
- 03.02 Humidity and its importance to textile materials
- 03.03 Moisture Regain and Moisture Content
- 03.04 Absolute humidity and Relative humidity
- 03.05 Standard atmosphere and testing atmosphere
- 03.06 Standard condition for testing of textile material
- 03.07 Determination of the humidity
- 03.07.01 Wet-and-dry bulb hygrometer
- 03.07.02 Hair hygrometer
- 03.08 Regain –Humidity Relations of textiles.
- 03.09 Factors affecting the regain of textile material : (Relative humidity, time, temperature, previous history of sample)
- 03.10 Effects of regain of fibre properties
- 03.11 Oven dry weight and correct in voice weight.
- 03.12 Determination of moisture
- 03.12.01 Conditioning oven
- 03.12.02 Shirley moisture meter
- 03.13 Standard regain percentage of textile material (cotton, silk, wool, jute, nylon, acetate, polyester etc.)

**TOPIC: 04- FIBRE TESTING:**
- 04.01 Fibre grade
- 04.01.01 Determination of colour, trash by trash analyser
- 04.02 Fibre length
- 04.02.02 Methods of Measuring fibre length
- 04.02.02.01 Comb sorter
- 04.02.02.02 Digital Fibregraph
- 04.03 Fibre Fineness
- 04.03.01 The importance of fibre fineness and definition of fineness
- 04.03.02 Methods of measuring fineness
- 04.03.02.01 Comb sorter
- 04.03.02.02 Digital Fibrograph
- 04.03.02.03 Uster Staple Apparatus
- 04.03 Fibre Fineness
- 04.03.01 The importance of fibre fineness and definition of fineness
- 04.03.02 Methods of measuring fineness
- 04.03.02.01 Gravimetric Method
04.03.02.02 Optical Method
04.03.02.03 Air-flow Method- W.I.R.A Fineness Meter.
04.04 Fibre maturity
04.04.01 Introduction and importance of maturity
04.04.02 Maturity ratio, Maturity count
04.04.03 Determination of maturity
04.04.03.01 Alkaline Swelling Method
04.04.03.02 Polarised light method
04.04.03.03 Differential dyeing method
04.05 Fibre strength
04.05.01 Principle of CRL, CRE, CRT, type tensile testing machine
04.05.02 Methods of measuring the strength of fibres
04.05.02.01 Single fibre strength testing
04.05.02.02 Bundle (group) fibre strength testing
04.05.02.02.01 Pressley Strength tester
04.05.02.02.02. Stelometer
04.05.03 Terminology and Definitions:
Load, Breaking Load, Stress, Mass Stress or Specific Stress, Tenacity or Specific Strength, Breaking Length, Strain, Extension, Breaking extension, The Loa-Elongation Curve, Stress, Strain Curve, Initial Young’s Modulus, Yield Point, Work of Rupture, Work Factor, Elastic Recovery, Fime and elastic properties, Factors influencing strength test results.

TOPIC 05:- YARN TESTING: [05]
05.01 Yarn Counts
05.02 Measurement of Length of yarn
05.02.01 Method of Length measuring
05.02.01.01 Hand wrap reel
05.02.01.02 Motorised warp reel
05.03 Skein Gauge
05.04 Yarn in short length (or piece of cloth)
05.05 Instruments used for count determination
05.05.01 Analytical Balance
05.05.02 Knowles Balance
05.05.03 Quadrant Balance
05.05.04 Beesley’s Balance
05.05.05 Lauth Sensitive Yarn Balance

TOPIC 06:- THE ELEMENTS OF STATISTICS: [10]
06.01 Definition
06.02 Importance in testing
06.03 Definition of terms used in statistics such as sample, sampling, sample size, population, histogram, frequency polygon, frequency, curve, and frequency distribution.
06.04 Average and other methods of location
06.04.01 Arithmetic Mean
06.04.02 Median
06.04.03 Mode
06.04.04 The relationship between method of location.
06.05 The Measurement of Dispersion or scatter-Range, mean range, percentage mean range, inter-quartile range, mean deviation, percentage mean deviation, standard deviation, co-efficient of variation, variation, variance and standard deviation.
06.06 Probability
06.07 Problems

Book Recommended:
01. Principle of Textile Testing - J.E. Booth
02. Hand Books of Methods of Testing - C.T.R.L.
03. Hand Books of Textile Testing & Quality Control - Grover
04. ISI Hand Books of Textile Testing - I.S.I.
05 Textile Testing - Angappan
06. Textile Testing - Skinkle
07. Textile Testing and Analysis - Vaishnav. Joshi

SCHEME OF EXAMINATION FOR FINAL EXAMINATION

F.M. : 80
TEXTILE CHEMISTRY-I

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S.No. | Topics | Periods
--- | ------ | ----
01. | Introduction | (02)
02. | Singeing | (02)
03. | Desizing | (04)
04. | Scouring | (05)
05. | Bleaching | (06)
06. | Mercerisation | (06)
07. | Dyeing | (13)
08. | Printing | (12)

CONTENETS:

TOPIC : 01- INTRODUCTION:

01.01 General considerations of textile chemistry
01.02 Elementary Chemistry: Formation of compounds, acid salts, the ‘ous’ and ‘ic’ conditions, double salts, oxidizing agents, reducing agents, some idea about Ph Number, Water- its hardness and purification.
01.03 Chemical Technology of Textile Fibres
01.03.01 Actions of acids and alkalies on textile fibres
01.03.02 Actions of oxidizing and reducing agents
01.03.03 Actions of Metallic salts
01.04 Important textile auxiliaries
01.05 Anionic, cationic and non-ionic substances
01.06 Wetting and Detergency

TOPIC: 02- SINGEING:

02.01 Introduction
02.02 Objects and principle of singeing
02.03 Different methods for singeing
02.03.01 Plate Singeing Machine
02.03.02 Roller Singeing Machine
02.03.03 Gas Singeing Machine
02.04 Merits and demerits of these above singeing machines

TOPIC: 03- DESIZING:

03.01 Objects
03.02 Methods of desizing, working principle of passing mangle
03.02.01 Hydrolytic desizing methods
03.02.01.01 Rot Steep
03.02.01.02 Acid Steep
03.02.01.03 Enzymatic Steep
03.02.02 Oxidative desizing methods
03.02.02.01 Chlorine desizing
03.02.02.02 Chlorine desizing
03.02.02.03 Bromite desizing
03.02.03 Continuous

TOPIC : 04 - SCOURING:

04.01 Introduction and objects
04.02 General conditions of scouring
04.03 Scouring operation
04.03.01 Samponification
04.03.02 Emulsification
04.03.03 Detergent action
04.03.04 Prolonged boiling
04.04 Machines used for scouring
04.04.01 Jigger
04.04.02 Winch Machine
04.04.03 Kier
04.04.03.01 Old type kier
04.04.03.02 Vertical kier
04.04.03.03 Horizontal kier
04.04.03.04 Comparison of horizontal and vertical kier
04.04.03.05 Steam injector kier
04.05 Efficiency of scouring

TOPIC: 05 - BLEACHING:

05.01 Objects
05.02 Auxiliary used for textile bleaching
05.03 Bleaching cotton
05.04 Bleaching process
05.04.01 Bleaching Powder
05.04.02 Bleaching hypochlorite
05.04.03 Hydrogen Peroxide, advantage and disadvantage of this process.
05.04.04 Sodium Chlorite
05.04.05 Bleaching of wool
05.04.06 Wool carbonization
05.04.07 Bleaching of silk
05.04.08 Process of Bleaching silk
05.04.09 Sodium Peroxide method
05.04.10 H₂O₂ method
05.04.11 Optical whitening agent
05.04.12 Application of Hydrogen Peroxide
05.04.13 One or Two Bath Method
05.04.14 Mixed Bleaching
05.04.15 Continuous Method
05.04.16 Du Pont Process
05.04.17 Development in Bleaching
05.04.18 National Peroxide Process
05.04.19 Rapid Bleach Process
05.04.20 Cold Peroxide Process
05.04.21 Simultaneous Scouring and Bleaching
05.04.22 Sourcing, Antichlorination
05.04.23 Bleaching of blended fabrics
05.04.24 Bleaching of coloured woven goods
05.04.25 Faults in bleaching and their removal

TOPIC: 06- MERCERISATION:

06.01 Objects
06.02 History and development of mercerisation
06.03 Factors determining the efficiency of mercerization (Barium Activity Number, Lustre, Deconvolution Count X ray Analysis)
06.04 Physical and Chemical changes in cotton due to mercerisation.
06.05 Description of the process of mercerisation.
06.06 Chain cloth mercerising machine.
06.07 Chainless cloth mercerising machine
06.08 Hank Mercerisation

TOPIC: 07- DYEING:

07.01 Nomenclature of dyes – Colour and Dyes, Colouring and Dyeing.
07.02 The dye molecule (chromophores and auxochromes)
07.02.01 Classification of dye molecules: Anionic, Cationic and Disperse.
07.02.02 Configuration of the dye molecule
07.03 Phenomenon of Dyeing.
07.03.01 The general theory of dyeing.
07.03.02 Affinity of a dye.
07.03.03 Dyeing aspects (Thermodynamic aspect and Kinetic aspect)
07.03.04 The role of water, electrolytes, heat and dye auxiliaries in dyeing
07.03.05 Dye auxiliary: Carriers of swelling agents, leveling agents (anionic leveling agents and cationic leveling agents)
07.03.06 Scouring after dyeing
07.04 Classification of dyes according to the mode of application.
07.05 Selection of dyestuffs.
07.06 General condition of dyestuffs.
07.07 Application of dyes
07.07.01 Direct Dyes
07.07.01.01 Introduction
07.07.01.02 Properties of Direct dyes
07.07.01.03 Methods of Application (cotton, wool, silk)
07.07.01.04 After treatment of direct colour dyed goods
07.07.02 Basic Dyes
07.07.02.01 Introduction
07.07.02.02 Properties of Direct dyes
07.07.02.03 Methods of Application (cotton, wool, silk)
07.07.02.04 Degumming of silk
07.07.03 Acid Dyes
07.07.03.01 Introduction
07.07.03.02 Properties and Classification of Acid dyes
07.07.03.03 Theory of Acid Colour Dyeing
07.07.03.04 Methods of Application (silk, wool,)
07.07.04 Sulphur Dyes
07.07.04.01 Introduction
07.07.04.02 Properties of Sulphur dyes
07.07.04.03 Methods of Application (cotton)
07.07.04.04 After treatment of Sulphr dyed goods
07.07.04.05 Tending of sulphur black, stripping of sulphur dyed material, solubilised sulphur dyestuffs.

TOPIC: 08- PRINTING:

08.01 Definition of textile printing and its significance.
08.02 Difference between dyeing and printing
08.03 The general theory of printing: dye molecule, role of water, thickener and steam; dry heating, washing off, fading, fastness to sunlight, wash fastness, dry cleaning fastness, fastness to perspiration, fastness to compounds and bleaches containing chlorine, fastness to sea water,
08.04 Classification of Textile printing- the method of printing and the style of printing
08.05 Stages of Printing
08.06 Methods of Printing
08.06.01 Block printing
08.06.02 Screen Printing
(Important constituents – screen table, screen, exposing unit, washing tray, printing paste) merits & demerits.
08.06.03 Roller Printing
08.06.03.01 Roller Printing Machine and its main parts.
08.06.03.02 Working of Roller Printing its advantages and disadvantages.
08.06.04 Faults in Roller Printing and Screen Printing and their rectification.
08.06.05 Automatic flat-bed screen printing machine.
08.06.06 Vertical Duplex Screen Printing
08.06.07 Rotary Screen Printing
08.06.08 Transfer Printing
08.06.09 Foam Printing
08.07 Preparation of Printing
08.07.01 Use of various ingredients and thickners.
08.07.02 Preparation of cloth for printing.
08.07.03 After treatments of printed goods.

Book Recommended:

01. A Glimpse on the Chemical Technology of Textile - R.R. Chackrvertty
02. The Bleaching, Mercerising & Dyeing of Cotton Materials - R.S. Prayag
03. Dyeing of wool, Silk and Man-Made Fibres - R.S. Prayag
04. Technology of Textile Printing - R.S. Prayag
05. Chemistry of Dyes & Principle of Dyeing - V.A. Shenai
06. Technology of Bleaching and Mercerising - V.A. Shenai
07. Technology of Printing - V.A. Shenai
08. Mercerising - J.T. Marsh
09. Principle of Textile Printing - D.G. Kale
10. Textile Scouring and Bleaching - E.R. Trotman
12. Chemical Processing of Textile - Sadov
13. The Dyeing of Textile Fibres - Textile Institute

SCHEME OF EXAMINATION FOR FINAL EXAMINATION     F.M. : 80
Rationale & Objectives:
The Engineering Mechanics Laboratory is a subject which will help technician to understand the application of theory that he has studied in practice by performing experiments and verifying results.

Besides the above the objective of the curriculum with effective skill will be developed in them to observe experimental data, and to analyses the results.

These topics of this curriculum will certainly build their confidence in performing the utilization of principle of mechanics in Civil Engineering works.

CONTENTS:
Eight experiments to be performed in the laboratory:

1. Determination of elongation of wire under external load.
2. Tensile Test on mild steel specimen.
3. Tensile Test on high tensile specimen.
4. Compression Test on metal.
5. Compression Test on bricks.
7. Determination of reaction at the support of beam.
8. Determination of bending moment of a simply supported beam.
9. Determination of reaction at the support of roof truss.
10. Determination of deflection of beams.
12. Determination of bending moment of a over hanging beam.
13. Verification of Polygon Law of forces.
14. Verification of Triangle Law of forces.
15. To find moment of inertia of fly wheel.
16. Compression Test on metal.
17. Tensile Test on M.S.specimen.
18. Determination of co-efficient of friction on inclined plane.

Books Recommended:

Text Books


**SCHEME OF EXAMINATION FOR FINAL EXAMINATION**

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F.M. : 40
COMPUTER PROGRAMMING THROUGH ‘C’ Lab.

Subject Code
00212

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CONTENTS:

List of Practicals:
1. Programming exercise on executing a C program.
2. Programming exercise on editing C program.
3. Programming exercise on defining variables and assigning values to variable.
4. Programming exercise on arithmetic and relational operations.
5. Programming exercise on arithmetic expressions and their evaluation
6. Programming on infix, postfix, transformation using stack.
7. Programs on insertion, deletion on link list.

Books Recommended:


SCHEME OF EXAMINATION FOR FINAL EXAMINATION

F.M. : 40
# YARN MANUFACTURE LAB. - I

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- **No of Periods Per Week**: 60
- **Full Marks**: 50
- **Annual Exam.**: 40
- **Internal Exam.**: 10

## CONTENTS:

### TOPIC: 01 - MIXING AND BLENDING

01.01 Study of various types of Cotton, Polyester, Viscose, Acrylic fibres etc. and its quality, properties as length, Micronaire value, Denier and Trash coming in mixing room.

01.02 Study of the following: Amount of Anti-static reagent used according to fibres and their blends. Tinting of fibres, waste addition in mixing, average blesn, mixing procedure for different fibres and their blends, relative humidity in mixing room, defects of wrong mixing in processing.

01.03 Study of mixing through Mixing Bale Opener (MBO).

### TOPIC: 02 - BLOW ROOM

02.01 Blow room machines –passage of the material through each m/c of blow room.

02.01.01 Hopper Bale Bale Breaker

02.01.02 Hopper Feeder

02.01.03 Porcupine opener

02.01.04 Vertical opener

02.01.05 Beaters

02.01.06 Step cleaner

02.01.07 Air jet cleaner

02.01.08 Spiro cleaner

02.01.09 Mono cylinder

02.01.10 ERM cleaner

02.01.11 Scutcher (Conventional & Automatic Modern)

02.02 Detail Study of the working of Blow Room machine in relation to setting, speed, performance.

02.03 Sketching the line and gearing diagram of the blow room machines.

02.04 Detailed study of Piano Feed regulating motion & cone drum.

02.05 Knock off Motion.

02.06 Study of Modern Blender and Bale Puckers.

02.07 Calculation of speed, production, hank of lap of blow room machine

02.08 Study of the chute feed system.

02.09 Study of the Scutcher tests ( Lap Evenness, Varimeter, Lap Weight Spot Test)

02.10 Study of the performance assessment process parameters, productivity and modernisation, effects of B/R performance & how to improve performance, high nep generation, high variability in lap, critical maintenance, lap defects & remedies, segregation of lap.

### TOPIC: 03 – CARDING

03.01 Detailed study of the function of the Card in relation to various parts of the m/c and passage of the material through m/c.

03.02 Sketching the line and gearing diagram of the carding machine.

03.03 Practice on stripping, grinding, setting, card clothing.

03.04 Practice on mounting of fillet to cylinder, doffer and flats.

03.05 Calculation of speed, draft and production of the machine.

03.06 Study of hank of lap and hank of sliver, size of the cams, waste extracted and disposal of waste, maintainancy schedule.

03.07 Study of quality control scheme charts, wrapping standards, temperature and humidity.

03.08 Study of card sliver testing: Card Web Evaluation (Nip), Sliver Evenness and Sizing (c.v.%, U%), sliver weight

03.09 Study of the effect of poor carding performance and how to improve performance.

03.10 Study of the productivity and modernisation, process parameters.

03.11 Study of the defects and remedies of card sliver.

### TOPIC: 04- DRAW FRAME

04.01 Sketching the line and gearing of draw frame and passage of the material through machine.

04.02 Dismantling, refitting and resetting of the draw frame of different cotton and hank.

04.03 Calculation of draft, speed and production of the m/c.

04.04 Study of hank of sliver fed and sliver delivered size of the careers, waste extracted and disposal of waste, maintainancy schedule (buffing etc.)

04.05 Study of quality control scheme – charts – wrapping standards, temperature and humidity, stop motion.

04.06 Study of D/F sliver testing: sliver everness and sizing (c.v.%,U%), sliver weight.

04.07 Study the effect of Poor D/F performance and how to improve performance.

04.08 Study of the productivity and modernisation, process parameters.

04.09 Study of the defects and remedies of D/F sliver.
TOPIC: 05- COMBING:

05.01 Preparatory process for combing
05.01.01 Silver lap machine
05.01.01.01 Sketching the line and gearing diagram of sliver lap machine and passage of the material through m/cs.
05.01.01.02 Calculation of speeds and production of the m/cs.
05.01.02 Ribbon Lap Machine
05.01.02.01 Sketching the line and gearing diagram of Ribbon lap machine and passage of the material through m/c.
05.01.02.02 Calculation of speed and production of the m/c.
05.01.03 Sketching the line and gearing diagram of super lap m/c and passage of material through this machine and also calculate its speeds and production.

SCHEME OF EXAMINATION FOR FINAL EXAMINATION  F.M.  : 40
FABRIC MANUFACTURE-I

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<td>Warping, Sizing, Beaming, &amp; Looming.</td>
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<td>Warp and Weft Preparation: Hand Process</td>
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CONTENTS:

**TOPIC: 01 – WINDING:**
01.01 Study the working of winding machine, sketching the line and gearing diagram of the winding machine. (06)
01.02 Practice of winding on them.
01.03 Calculation of speed and Production of winding m/c.

**TOPIC: 02- PIRN WINDING:**
02.01 Study the working of Pirn winding machines, sketching the line and gearing diagram of these machine. (06)
02.02 Practice of Pirn Winding on them.
02.03 Calculation of speed and production of Pirn Winding m/c.

**TOPIC:03- WARPING, SIZING, BEAMING & LOOMING:**
03.01 Study the Working of Warping, Sizing, Beaming and Looming machines, sketching the line and gearing diagram of these machines. (06)
03.02 Practice of Warping, sizing, Beaming and Looming on them.
03.03 Calculation of speed and Production of the above m/cs.

**TOPIC: 04- WARP & WEFT PREPARATION: HAND PROCESS:**
04.01 Study the Yarn Preparation for Handloom (06)
04.02 Practice of the various yarn preparation process on yarn preparatory m/cs for handloom.

**TOPIC: 05- PRIMARY MOTIONS:**
05.01 Detailed study of primary motions (12)
05.01.01 Shedding
05.01.02 Picking
05.01.03 Beat Up
05.02 Dismantling and resetting of the parts of the above motions.
05.03 Sketching the above motion parts.

**TOPIC : 06- SECONDARY MOTIONS:**
06.01 Detailed study of secondary motions (09)
06.01.01 Take Up Motion (5 wheel and 7 wheel)
06.01.02 Let Off Motion
06.02 Dismantling and resetting of the parts of the motions.
06.03 Sketching the above motion parts.

**TOPIC: 07- TERTIARY MOTIONS:**
07.01 Detailed study of the tertiary motions (06)
07.01.01 Weft Fork Motion
07.01.02 Warp Protecting Motion (Loose reed & fast reed)
07.02 Dismantling and resetting of the above motions.
07.03 Sketching the above motion parts.

**TOPIC : 08- LOOMS:**
08.01 Study the handloom and practice of weaving on them.
08.02 Study the handloom and practice of weaving on them.

SCHEME OF EXAMINATION FOR FINAL EXAMINATION F.M. : 40

26
TEXTILE TESTING Lab.-I

Subject Code
18215

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01 | Sampling | (06)
02 | Fibre Testing | (24)
03 | Moisture Relation Testing | (06)
04 | Identification and Estimation of Fibres in Textile Materials | (15)
05 | Yarn Testing | (09)

CONTENTS:

**TOPIC: 01 - SAMPLING:**
01.01 Sampling of raw cotton by ISI Method and estimate ginning percentage and lint index.
01.02 Sampling of cotton by B.S.I. method and estimate ginning percentage and lint index.

**TOPIC: 02 - FIBRE TESTING:**
02.01 Fibre length
02.01.01 Determination of fibre length by Halo and Butterfly Method.
02.01.02 Determination of fibre length by Baer Sorter Method.
02.01.03 Determination of fibre length by Ball Sorter Method.
02.01.04 Determination of fibre length parameters using Uster stapler.
02.02 Fibre Finessness
02.02.01 Determination of fibre fineness by Gravimetric metheod.
02.02.02 Determination of fibre fineness by Air-flow method. (WIRA Finesseness Meter)
02.03 Fibre Maturity
02.03.01 Determination of percentage maturity of cotton by polarized light (Miscroscope) Method.
02.03.02 Determination of Maturity Co-efficient by Alkaline method.
02.04 Fibre Strength.
02.04.01 Determination of single fibre strength by the instruments available in laboratory.
02.04.02 Determination of Bundle fibre strength by Stelometer.

**TOPIC: 03 - MOISTURE RELATIONS TESTING:**
03.01 Determination of moisture regains moisture content and legal weights by using conditioning oven.

**TOPIC: 04 - IDENTIFICATION AND ESTIMATION OF FIBRES IN TEXTILE MATERIALS**
04.01 Identification of textile fibres.
04.01.01 Identification of fibres by longitudinal view using optical microscope also determine the mean width o fibres.
04.01.02 Identification of fibres by cross-sectional view using microscope.
04.01.03 Identification of Textile material by chemical analysis and also burning test of fibres.
04.01.04 Quantitative Analysis and Estimation of Mixture of fibres in textile materials.

**TOPIC: 05 - YARN TESTING:**
05.01 Determination of Yarn Count by:
05.01.01 Beesley’s Balance
05.01.02 Quadrant Balance
05.01.03 Torsion Balance & Analytical Balance

**SCHEME OF EXAMINATION FOR FINAL EXAMINATION**
F.M. : 40
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<th>S.No.</th>
<th>Topics</th>
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<td>[06]</td>
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**CONTENTES:**

**TOPIC: 01 - SCOURING:**  
01.01 Scouring of cotton, wool, silk (begumming of silk)  

**TOPIC: 02 – BLEACHING:**  
02.01 Bleaching of cotton, silk, wool  
02.02 Determination of available chlorine strength of hydrogen peroxide.  

**TOPIC: 03 – MERCERISATION:**  
03.01 Mercerisation of cotton materials and determine its efficiency  

**TOPIC: 04- DYEING:**  
04.01 Dyeing of three single shades with direct dyes on cotton.  
(0.5%, 0.8%, 1.0%, 1.2%, 1.5%, 2.0%)  
04.02 Dyeing of three mixture shades with direct dyes on cotton.  
(0.5%, 0.8%, 1.0%, 1.2%, 1.5%, 2.0%)  
04.03 After treatment given to direct with basic dyes on cotton.  
04.04 Dyeing of three single shade with basic dyes on cotton.  
(0.5%, 1.0%, 1.5%, 2.0%)  
04.05 Dyeing of three mixture shades with basic dyes on cotton.  
(0.5%, 1.0%, 1.5%, 2.0%)  
04.06 Dyeing of three single shade with basic dyes on wool.  
(0.5%, 1.0%, 1.5%, 2.0%)  
04.07 Dyeing of three mixture shades with basic dyes on wool.  
(0.5%, 1.0%, 1.5%, 2.0%)  
04.08 Dyeing of three (single + mixture) shade with basic dyes on silk.  
(0.5%, 1.0%, 1.5%)  
04.09 Dyeing of three single shade with acid dyes on wool.  
(0.5%, 0.8%, 1.2%, 1.5%)  
04.10 Dyeing of three single shades with acid dyes on silk.  
(0.5%, 0.8%, 1.2%, 1.5%)  
04.11 Dyeing of three mixture shades with acid dyes on silk.  
(0.5%, 0.8%, 1.2%, 1.5%)  
04.12 Dyeing of three mixture shades with acid dyes on cotton.  
(0.5%, 0.8%, 1.2%, 1.5%)  
04.13 Dyeing of three single shade with sulphur dyes on cotton.  
(0.5%, 0.8%, 1.2%, 1.5%)  
04.14 Dyeing of three mixture shades with sulphur dyes on cotton.  
(0.5%, 0.8%, 1.2%, 1.5%)  
04.15 After treatment given to sulphur coloured dyed goods.  
04.16 Matching the colour for a given dyed sample material and estimate the percentage of colour and chemical used.
Subject Code: 18217

### Practical Information
- **No. of Periods Per Week**: 60
- **Full Marks**: 50
- **L**: 0
- **T**: 0
- **P/S**: 03
- **Annual Exam.**: 40
- **Internal Exam.**: 10

### CONTENTS:

#### TOPIC: 01 - CLOTH ANALYSIS:

01.01 Analysis of small sample of cloth for the purpose of reproduction (simple weaves like elementary weaves & its derivatives, diamond & diaper, simple, simple fancy weaves).

#### TOPIC: 02 - DESIGN:

02.01 Practice of conversion of simple artistic design to design paper for weaving.

#### TOPIC: 03 - ELEMENTS OF COLOUR:

03.01 Preparation of colour charts showing primary, secondary and tertiary colour.

### SCHEME OF EXAMINATION FOR FINAL EXAMINATION

**F.M.**: 40
YARN MANUFACTURE Lab.-I

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Rationale & Objectives:

Same as that of Yarn Manufacture Lab. –I, Subject Code – 18213.

CONTENTS:

Same as that of Yarn Manufacture Lab. –I, Subject Code – 18213.
FABRIC MANUFACTURE Lab.-I

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Rationale & Objectives:

Same as that of Yarn Manufacture Lab. –I, Subject Code – 18214.

CONTENTS:

Same as that of Yarn Manufacture Lab. –I, Subject Code – 18214.
TEXTILE CHEMISTRY Lab.-I

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Rationale & Objectives:
Same as that of Textile Chemistry Lab. –I, Subject Code – 18216.

CONTENTS:
Same as that of Textile Chemistry Lab. –I, Subject Code – 18216.