DETAILED SYLLABUS FOR THE POST OF TECHNICAL SUPERVISOR (GENERAL CATEGORY) IN KERALA STATE HANDLOOM WEAVERS CO-OPERATIVE SOCIETY LTD. (HANTEX)) - DIRECT RECRUITMENT AND BY TRANSFER

(CAT.NOS: 701/2022, 702/2022)

MODULE- I: TEXTILE FIBERS AND YARN

(Marks : 10)

POLYMER TO FIBRE CONVERSION

Terminologies: monomer, polymerisation, degree of polymerisation, polymer. Polymerization Techniques; classification of polymers - Homo polymer, Co - polymer, Atactic, Syndiotactic and Isotactic polymer. Man-made fibre spinning techniques; Melt and solution spinning techniques, Polymer selection and preparation, Post spinning operation - drawing, types of heat setting, influence of heat setting on fibre behaviour.

BASICS OF TEXTILE FIBRES

Definition of Textile Fibres, Classification of fibres, study of morphological structures of fibres. Terminology related to Fibres, Introduction to textile fibres- staple fibre, filament, tow, UDY, POY and FOY. Dope dyed and de lustred fibres. Types of yarn - spun, continuous filament, mono filament, multi filament, flat and textured yarn. Single, ply and cabled yarns. Physical properties of textile fibres, essential and desirable properties of Textile Fibres. Concept of crystalline nature of a polymer and Orientation.

CELLULOSIC FIBRES

Natural vegetable fibres - Cotton, linen, jute and hemp, chemical composition, physical and chemical properties, uses.

Regenerated fibres - Viscose and Polynosic rayon, manufacturing process, physical properties, chemical properties, uses.

ANIMAL FIBRES

Silk - Life cycle of silk worm, types of silk, silk rearing, reeling, spun silk producing techniques. Throwing and weighting, Chemical composition, physical and chemical properties, uses.

Wool - Varieties, grading, fibre extraction, chemical composition. Physical and chemical properties, uses.

SYNTHETIC FIBRES

Nylon6 and Nylon 66- Manufacturing process, physical properties, chemical properties, uses.

Polyester, polyethylene, polypropylene, acrylic- Manufacturing process, physical properties, chemical properties, uses. Aromatic polyamides; Nomex and Kevlar - Manufacturing process, physical properties, chemical properties and uses.

SHORT STAPLE SPINNING

Process flow chart of carded and combed yarns; Objectives, principles and description of opening, cleaning and blending. Machines used in blow room, Lap feed and chute feed systems, Objectives of carding, Objectives and advantages of combing process, Objectives of draw frame.

Ring spinning -Principle of yarn formation, S twist, Z twist, TPI. Yarn doubling- Direction of twist, Balancing of twist.

Reeling – Objectives and description of reeling process. Bundling and Baling- Objectives and description of Bundling and Baling.

MODULE- II: HANDLOOM WEAVING TECHNOLOGY

(Marks : 10)

WEAVING PREPARATORY PR0CESS

Different forms of yarn packages - hanks, cones, cheeses and spools- purpose and use; essential characteristics of warp and weft yarn. Preparatory process; warping- peg warping, vertical warping and sectional warping; Sizing- objectives, importance of sizing, ingredients used in size mixture and their functions, various forms of sizing- hank sizing and street warp sizing, size recipe for cotton, viscose, polyester and cotton blends, common defects during sizing- their causes and remedies.

HANDLOOMS AND SHED FORMATIONS

Evolution of handlooms- various parts of a hand loom and their functions, types of hand looms - throw shuttle handloom, fly shuttle handloom, pit loom & frame loom, motions of a handloom – primary, secondary & auxiliary motions; Different types of shed formations - centre closed shed, bottom closed shed, top closed shed, open shed and semi open shed; shedding mechanism of handlooms using treadles and heald reversing motions- roller system, pulley reversing system and jack and lam rod system.

PRIMARY AND SECONDARY MOTIONS OF HANDLOOMS

Primary and secondary motions. Handloom dobbies- lattice dobby, barrel dobby, bottom closed shed dobby; working principle and suitability. Design and essential features of a pit loom. Picking mechanism of handloom, types of shuttles- throw shuttle, fly shuttle and roller shuttle, design and suitability; beat up- closed shed beating and crossed shed beating, different types of reed - bamboo reed, pith bound, steel reed and all metal steel reed, suitability for various fabrics; let off motion in handlooms -ratchet and pawl, rope and weight, rope- lever and weight; take up motion in handloom - poker rod and 'ratchet & pawl'; auxiliary motions of a handloom -temple motion and terry motion.

JACQUARDS

Functions of Jacquard, Types of Jacquard, Jacquard mechanism, Figuring capacities of Jacquards, Types of sheds in Jacquard Shedding, Types of Jacquards- SLSC Jacquard, DLSC Jacquard, DLDC Jacquard, Open shed Jacquards. Harness building, Harness Ties, Casting out, Card cutting and Card Lacing.

MODULE- III: FABRIC STRUCTURE-1

(Marks : 10)

INTRODUCTION TO TEXTILE DESIGNING

Classification of textile fabrics; classification of woven fabrics - simple, compound and complex: fundamental aspects of woven fabrics-count of graph paper, Methods of representing design on graph paper, Principle of Design, draft, denting, lifting & tie-up plans. Types of draft - straight draft, skipped draft, pointed draft, herring bone draft, mixed draft etc. Plain weave - ornamentation of plain weaves; study of derivative structures of plain weave - regular and irregular warp rib, weft rib, hopsack and basket weaves. Catch-cord technique; design, draft, denting, peg plan and tie-up plan.

TWILL WEAVES AND ITS DERIVATIVES

Twill weaves; classification of twills - warp faced twill, weft faced twill and equal faced twill, Left hand twill and Right hand twill; angle of inclination of twill lines- Steep twill and Flat twill; influence of the twist direction of yarn over prominence of twill lines. Derivatives of twill weaves - wavy twill, herringbone, transposed twill, broken twill, elongated twill, combined twill, figured twill- Drafts, lifting plan & tie up, treadling plan for the above designs.

DIAMOND AND SATIN WEAVES

Diamond weave, twill dice check, diaper; regular and irregular sateen and satin, satin dice check weaves - design, draft, denting plan, Peg plan and tie- up plan. Difference between diamond and diaper, satin and sateen.

TOWELLING WEAVES

Honey comb weaves- ordinary honey comb, stitched honey comb and Brighton's honey comb designs. Huck-a-Back weave- Construction of standard Huck- a - Back (10 X 10), Devon's Huck- a- Back- draft, denting, Peg plan and tie- up plan. Mock leno and corkscrew weaves- Design, draft, denting, Peg plan and tie- up plan.

FANCY AND COLOUR AND WEAVE EFFECTS

Crepe weaves- construction upon sateen base, by combination of floating weaves with plain thread, by reversing and by insertion of one weave over another. Combination of weaves - twill and plain, mock-leno and plain, honey comb and plain, stripe and check effect produced by these combinations.

Introduction to colour and weave effects- continuous line effect, hounds tooth patterns, bird's eye and spot effects, hairline stripes, step patterns and all over effects. Distorted thread effects - salient feature, warp and weft distortion.

MODULE- IV: FABRIC STRUCTURE- II

(Marks : 10)

CORDED AND RIB STRUCTURES

Bedford cord weaves - salient features, plain faced Bedford cord (regular and alternate pick principle), twill faced bed ford cord, wadded bed ford cord, and crepon bed ford cords. Welt & Pique structures - salient features and manufacturing techniques, ordinary structure, wadded structure (loose back and fast back); Difference between welts and piques, Difference between Bedford cord and welt. Design, draft, denting, peg/tie-up plan and thread interlacing diagram of above weaves.

DOUBLE LAYER CLOTH AND ITS TYPES

Double cloth - classification, Step by step construction of self-stitched double cloth, reversible and non-reversible varieties using twill, sateen and satin; Centre stitched double cloth: double width plain cloth, plain Tubular cloth. Thread interchanging double cloth warp thread interchanging double cloth, weft thread interchanging double cloth. Cloth interchanging double cloth using plain and twill weaves; Stripes and check effects using cloth interchanging principle; wadded double cloth - warp wadding and weft wadding. Design, draft, denting, peg/ tie-up plan and thread interlacing diagram of above weaves.

TREBLE CLOTH AND BACKED CLOTH

Treble width plain cloth: Treble cloth using will, satin, and sateen. Backed cloths- warp & weft backed cloths-warp wadded and weft wadded backed cloth-Reversible and non-reversible using twill, sateen and satin Imitation

backed cloth, imitation warp and weft backed cloths. Design, draft, denting. Peg plan and tie-up of above weaves.

COMPOUND WEAVE STRUCTURE- PILE WEAVE

Pile fabrics - Salient features, classification of pile fabrics- loop pile and cut pile, warp pile and weft pile. Terry piles - salient features, terry mechanism; classification of terry pile structures - 3 pick, 4 pick, 5 pick and 6 pick terry. Basic principles and weaves of warp pile fabrics produced with the aid of wires and face to face weaving. Construction of Weft pile designs - Construct Plain back. Twill back pile designs, corded velveteen-design, draft, denting, peg plan and tie-up of above weaves.

INTRODUCTION TO COMPLEX WEAVES

Principles of Cross weaving-Various types of sheds formed in cross weaving -Construction of plain gauze & leno – drafting, lifting plan. Extra warp and extra weft designs.

JACOUARD CARD PUNCHING AND EXTRA WARP AND WEFT DESIGNS

Count of graph paper- Factors influencing the selection of appropriate count of graph paper.

Jacquard graph development and card punching technique for different harness ties. Traditional jacquard mountings- heald and harness mountings, Pressure harness, Bannister harness, working comber boards. Damask - Salient features, Structure of cloth and Designing. Enlargement and punching techniques for jacquards.

MODULE- V: CHEMICAL PROCESSING OF TEXTILES– I

(Marks : 10)

PRETREATMENT OF COTTON

Need for preparation of grey goods& preparatory process sequence for different process of cotton material.

Singeing- objective & methods of singeing; Gas singing machine- working, precautions, merits & demerits. Desizing of cotton- objective, methods, Acid & enzyme desizing with merits & demerits. Scouring of cotton-objective, Chemistry, methods of scouring. Bleaching of Cotton- Objective, Chemistry, methods of bleaching, Hypochlorite & Hydrogen peroxide bleaching.

Optical brightening agents, Mercerization of Cotton- Objective, Chemistry, methods of mercerization, merits and demerits.

Dyeing- Classification of dyes, Dyeing Terminologies; Machineries- Kier, J-Box, Jigger, Winch, Padding Mangles, Cabinet Hank dyeing machine, package dyeing machine, HTHP Beam dyeing machine, Jet Dyeing, Soft

Flow& Over Flow dyeing machine, Hydro extractor, Cylinder dryer and Hot Air Stenter.

APPLICATION OF DIRECT AND REACTIVE DYES ON COTTON

Dyeing cotton with Direct Dyes- Classification, Mechanism, Recipe, Process conditions and procedure of application. After treatment of direct dyed cotton material, cationic dye fixing agents. Dyeing of cotton with Reactive Dyes: Classification, Mechanism, Recipe and procedure for application of M brand, H brand and VS dyes.

APPLICATION OF VAT, AZOIC AND SULPHUR DYES ON COTTON

Dyeing of cotton with Vat Dyes- Classification, Mechanism, Recipe, procedure of application and concepts of Solubilised Vat Dyes and Vat Dyes. Dyeing of cotton with Azoic Dyes- Mechanism, Recipe and procedure of application. Dyeing of cotton with Sulphur Dyes: Classification Mechanism, Recipe and procedure of application. Tendering & Bronziness.

PRETREATMENT AND DYEING OF WO0L AND SILK

Pre- treatment of Silk- Degumming, bleaching with hydrogen peroxide. Dyeing of Silk with Acid & Metal Complex- Classification, Mechanism, Recipe and procedure of application.

Pre-treatment & Setting of wool, Scouring, Milling, Potting, Crabbing, Decatising and Bleaching with Hydrogen peroxide. Dyeing of Wool with Acid, Metal Complex and Chrome dyes- Mechanisms, Recipe and procedure of application.

MODULE- VI: CHEMICAL PROCESSING OF TEXTILES –II

(Marks : 10)

PRETREATMENT AND DYEING OF POLYESTER

Pre-treatment of Polyester: Scouring and bleaching with sodium chlorite, Heat Setting Objective & Methods. Dyeing of Polyester with Disperse dyes: Mechanism. Recipe. Process conditions with procedure of application for Carrier, HTHP & Thermosol dyeing. Dyeing defects, damages and their remedies.

INTRODUCTION TO PRINTING

Textile Printing: Differentiate Dyeing and Printing, ingredients of printing paste and their functions. Methods of printing- block Printing, Screen Printing, Rotary and Flatbed Screen Printing and Transfer Printing, merits and demerits of each. Styles of Printing- Direct, Resist and Discharge Printing.

Traditional styles of Printing- Tie & dye, Kalamkari and Batik printing. After Treatments in printing-Steaming, Ageing and Curing.

DIRECT STYLE OF PRINTING

Printing of cotton with direct dyes& Reactive dyes in direct style: recipe & Procedure.

Printing of cotton with Pigments: recipe & Procedure

Printing of Silk with Acid dyes: recipe & Procedure.

Printing of Polyester with Disperse dyes; recipe & Procedure.

INTRODUCTION AND MECHANICAL FINISHES

Textile Finishing: Object & factors affecting selection of finishes.

Classification: Mechanical and Chemical Finishes, Temporary and Permanent Finishes.

Mechanical Finishing: Calendaring, preshrinking, Raising or Napping, Shearing and Sueding.

CHEMICAL FINISHES

Chemical finishing: Wrinkle-resist finishing, Softening, Stiffening, Waterproof, water repellent, Soil repellence, soil release, Antistatic, flame retardant and flame resistant finish.

MODULE- VII: TEXTILE TESTING I

(Marks : 10)

SAMPLING

Definition of quality- importance of quality assessment- selection of samples for quality assessment - random and biased samples - squaring technique and zoning technique for fibre Selection; Yarn sampling - use of random numbers - sampling for various types of yarn tests.

MOISTURE RELATED PROPERTIES OF TEXTILES

Atmospheric conditions- absolute humidity, relative humidity and standard atmospheric testing conditions. Measurement of atmospheric conditions, Instruments used for determination of Relative Humidity- Wet and dry bulb hygrometer; Concept of Moisture Regain and Moisture Content - Relation between Regain and Content, Corrected yarn count in standard regain value. Effect of Moisture on fibre properties, Factors affecting moisture Regain of textile materials, Standard regain values of textile fibres; Measurement of Moisture Regain and Moisture Content, Moisture Testing Oven.

FIBER LENGTH, FINENESS AND MATURITY

Fibre testing- the fibre quality index and spinnability; Fibre length and length uniformity measuring techniques. Fibre fineness – definition, importance in yarn manufacture and measurement techniques. Cotton

fibre maturity- estimation of maturity ratio and index by microscopic method, estimation by other methods -optical, air flow, differential dyeing; importance of fibre maturity in spinning.

TENSILE PROPERTIES OF FIBER AND YARN

Tensile testing of Textiles – Introduction, Terminology and definitions, Load and elongation curve, stress and strain curve. Tensile strength testing modes - CRT, CRE and CRL; Factors affecting the test results obtained from testing instruments. Fibre strength measurement- Pendulum lever principle (CRT), single yarn strength tester, Inclined plane principle (CRL), Scott IP Tester, Strain gauge principle (CRE). Lea strength and CSP.

YARN COUNT, TWIST, MASS, EVENNESS

Count measuring systems. Measurement of Yarn Count; weighing method of measuring yarn count- Knowles balance, Quadrant balance and Beasley's balance. Significance of Yarn Twist - Twist direction, Twist factor and Twist Multiplier, Twist angle. Function of twist in yam structure, Twist and yarn strength, Effect of twist on fabric properties; Measurement of twist using Straightened fibre method and Twist contraction method. Yarn mass evenness parameters, measurement; electronic mass evenness determination, Yarn fault classification.

MODULE- VIII: TEXTILE TESTING – II

(Marks : 10)

CONSTRUCTION CHARECTERISTICS

Basic fabric particulars -ends and picks per inch, count of warp and weft, determination of the type of weave, measurement of length, width, thickness, area, density (GSM), measurement of warp and weft crimp in fabrics. Cover factor. Fabric sampling techniques.

FABRIC STRENGTH RELATED PROPERTIES

Tensile strength measurement - ravelled strip test and grab test, mechanical and electronic measuring systems. Tear strength, Bursting strength, Ballistic impact strength- importance and measurement.

COMFORT AND SURFACE CHARACTERISTICS

Fabric stiffness -principle of measurement of flexural rigidity; Drape– measurement of drape coefficient; Crease recovery measurement. Wrinkle recovery- assessment using standard grades; Principle and functioning of air permeability testers. Determination of water repellence, fabric shrinkage, Fabric abrasion resistance and Fabric pilling resistance.

FASTNESS PROPERTIES OF TEXTILES

Objectives, testing of various fastness properties of textile materials. Various standards and procedures to assess washing fastness, rubbing fastness, light fastness and perspiration fastness property of a textile material.

FABRIC INSPECTION AND GARMENT QUALITY EVALUATION

Fabric inspection - Manual, semi-automatic and Automatic Inspection systems. Classification of fabric defects, Method of Grading- 4 point system and 10 point system. Acceptable quality level (AQL), MIL standards and final inspection Quality assessment of Garment. Cutting, sewing, pressing, finishing and packaging defects.

MODULE- IX: YARN AND FABRIC CALCULATION AND COSTING

(Marks :10)

YARN NUMBERING SYSTEMS AND ITS CONVERSION

Introduction to numbering of yarns; indirect system of numbering yarns- New English cotton, spun silk, spun rayon, New French, metric, worsted, Woolen Yorkshire and linen. Direct system of numbering yarns – Denier, flax/ jute/ hemp.

Universal system of yarn numbering- Tex and its derivatives (milli tex, kilo tex).

Determination of conversion factors, converting count of yarn from one system to another -indirect to indirect, direct to direct, indirect to direct, direct to indirect.

FOLDED YARN COUNT, HEALD COUNT AND REED COUNT

Count of folded yarns, contraction due to twisting, determination of equivalent count and resultant count of folded yarns, amount of component threads in folded yarn, average count of warp.

Heald count; reed Count- dents per linear space and groups of dents per linear space, stockport system. Relation between- reed count, number of ends per dent, ends per inch and width of cloth.

FABRIC CALCULATIONS

Determination of Ends per inch and Picks per inch while changing count, weave and both to maintain the same level compactness. Determination of count of Warp & Weft. Determination of ends per inch and Picks per inch while increasing or decreasing the weight of fabric to maintain same level of compactness.

Cloth calculation -Amount of Warp and Weft weight per linear meter, weight per square meter using Direct, Indirect and Universal systems of yarn count. Pierce's formula for estimation of diameter of yarns; relative diameter of yarns; calculation of cloth cover - warp cover, weft cover and

cloth cover. Estimation of fractional cover, percentage cover and cover factor.

Yarn winding calculations – Hank, cone, cheese and pirn- production, efficiency and production planning

Woven Fabric costing- Yarn cost, warp weight, Weft weight, preparation charge costing, sizing cost, warping cost, weaving cost, miscellaneous cost, profit & cost sheet.

MODULE- X: TECHNOLOGICAL DEVELOPMENTS IN HANDLOOMS

(Marks : 10)

DEVELOPMENTS IN HANDLOOM WEÁVING PREPARATORY MACHINES

Objectives of Technological developments in handlooms- the layout of loom shed, its merits and demerits - Limitations of Hand operated pirn, cheese and bobbin winding. Advantages of single spindle and multi spindle winding machines over hand operated charkas.

DEVELOPMENTS IN STRUCTURE OF HANDLOOM

Importance of Angle iron pillars and cross bars used in place of wooden pillars and cross bars in pit looms - Power operated in-house beaming machine for long length of warp and its advantages- Improved Frame loom and its advantages.

DEVELOPMENTS IN TAKE UP AND HANDLOOM DOBBIES

5 wheel take up motion and worm & worm wheel take up motions used in handlooms - Drop box or vibrating box attachments on handlooms -Vertical Handloom dobby - Its merits and demerits. Plunger mechanism used in Durry(Dhurrie) weaving and its advantages.

SOLID BORDER WEAVING AND TWIN CLOTH

Weaving on handlooms with multiple jacquards Solid border weaving with catch cord technique - Solid border weaving sley - Multiple butta weaving sley - Advantages and disadvantages of these mechanisms. Twin cloth weaving sley. Improved pit loom.

SEMI AUTOMATIC HANDLOOM AND ITS ATTACHMENTS

Semi-automatic looms - Nepali pedal loom, Chittaranjan loom, banaras semi- automatic loom, itchalkaranchi loom - Electric motor operated jacquard lifting mechanism, Pneumatic lifting mechanism for jacquard. Electromagnetic lifting mechanism for heald, Objectives, details of schemes, Silk mark - Objectives, details of scheme. Introduction to Global Organic Textile standard (GOTS)

HANDLOOM (RESERVATION OF ARTICLES FOR PRODUCTION) ACT, 1985

The Handloom (Reservation of articles for Production) Act, 1985; Terms and definitions. Range reserved for excusive production by handlooms.

NOTE: - It may be noted that apart from the topics detailed above, questions from other topics prescribed for the educational qualification of the post may also appear in the question paper. There is no undertaking that all the topics above may be covered in the question paper