DETAILED SYLLABUS FOR THE POST OF WEAVING INSTRUCTOR/ WEAVING ASSISTANT/ WEAVING FOREMAN (MALE ONLY) IN PRISONS AND CORRECTIONAL SERVICES -

CAT NO: 679/2023

MODULE I – 10 MARKS (TEXTILE FIBRES)

Classification of textile fibres based on origin and chemical nature with examples - General properties of Textile fibres - Essential properties and Desirable properties of Textile fibres. Identification of textile fibres.

Physical properties and chemical properties of various Textile fibres like Cotton, Jute, Linen, Silk, Wool, Viscose Rayon, Acetate Rayon, Nylon, Polyester, Polyethylene, Polypropylene, Acrylic fibre, Poly Urethane Fibre etc…. Features and uses of fibres like Lyocell, Modal, FR viscose, Bamboo fibre, Spandex, Aramid, PVA, Carbon & Glass fibres. Physical structure and chemical composition of various textile fibres like Cotton, Wool, Silk etc…

Botanical classification of cotton, Types of commercial cotton and their properties. A brief study of organic cotton & BT Cotton. Processes involved in the Extraction of linen from the Flax plant.

Study of Varieties of silk, Sericulture, Various stages involved in the production of Raw Silk from cocoons, reeling of Silk, Throwing and Doubling of silk, Degumming and weighting of silk. A brief study of Commercial Varieties of wool, Classification based on Shearing of wool, Carbonisation, Scouring and Felting of wool.

Understand the classification of manmade fibres, Know the different methods of spinning and the drawing process for manmade fibres, Study of chemicals used and various steps involved in the manufacturing of semi-synthetic and synthetic fibres like Viscose Rayon, Acetate Rayon, Nylon 6, Nylon 6.6 and Polyester fibres.

MODULE II – 10 MARKS (DESIGN AND STRUCTURE OF FABRICS)

Application of Point paper in textile Designing - count of point paper - Understanding the terms design, draft, lifting plan and denting plan.- straight draft, broken draft, point draft, mixed draft.- plain weave, warp rib weaves, weft rib weaves and mat weaves, modification of plain weaves.- twill weaves-Classification - Warp faced twill.- Weft faced twill- Even faced twill- Steep twill- Flat twill- Left hand twill- Right hand twill- Simple twill- Compound twill- Modification of twill weaves- Satin and sateen designs- Warp Corkscrew and weft Corkscrew designs- Combined twills- Figured twill- Zigzag twills- Diamond twills- Broken twills- Broken and reversed twill- Drafts for the above designs- Influence of yarn twist on the prominence of twill lines.

General requirements of a towelling fabric- Weaves used for towelling fabrics- Construction of 3-pick terry, 4-pick terry and, 5-pick terry- Construction of ordinary honey comb, Brightons honey comb- Features of Huck – a – Back fabrics- Construction of Devon's Huck– a– Back, 10 X 10 Huck– a– Back, Honey comb Huck – a- Back weaves, Reversible Huck – a- back weaves- Drafts applicable to the above designs- Features of pile fabric- Classification- Construction of Velvet, Velveteen- True warp pile, Two pick to a wire, Three pick to a wire, Fast true warp pile, Half the pile over each wire- Differentiate warp pile and

weft pile structures- Importance of cutting and finishing in the production of weft piles– velveteen- Classification of velveteen- Construct Plain back, Twill back, Corded, Corded velveteen with twill as ground weaves- Features of crepe weaves- Different systems of constructing crepe weaves- By adding marks to satin weaves, Combining plain threads with a floating weave, Inserting one weave over another, Reversing a small repeat, Chemical treatments used to impart crepe effects- Principle of seer sucker fabrics.

MODULE III – 10 MARKS (ADVANCED WOVEN FABRIC DESIGN)

General features of Bedford cord fabrics- Construction of plain face Bedford cord, Twill face Bedford cord, Wadded Bedford cord and develop their drafts- Functions of cutting ends, face ends and wadding ends- Features of Pique fabrics- Differentiate pique fabrics and Bedford cord fabrics- Functions of cutting, face, wadding and back picks- Construction of various types of pique fabrics, Plain one shuttle of pique, Coarse cut pique, Fine cut pique, Wadded pique, Backed pique- System of Drafting and Denting applicable to above weaves- Additional attachments required in a loom to weave Bedford cord and Pique fabrics. Importance of Double, Open Double width, Treble, Tubular and Interchanging double cloth- Construct Double cloth, Double width cloth, Tubular, Treble, Interchanging Double cloth. Importance of extra warp and extra weft figuring in the ornamentation of fabrics- Importance of All over figuring, Stripe figuring and Spot figuring- Features of Toilet Quilt fabrics- Construct examples for 2 pick and 3 pick Toilet Quilt.

Perforated fabrics- Uses- Construct 3 X 3, 4 X 4, 5X5 Mock- Leno- Draft and Denting plan- Speciality of denting for Mock-leno designs- Principles of Cross weaving- Application of Doup Healds- Differentiate Gauze and Leno- Standard diagram of the cloth structure, Drafting and lifting plan for Plain Gauze, Cellular leno, Net leno/ Spider leno- Various types of sheds formed in cross weaving- Plain shed, Open shed and Cross shed formed in cross weaving with bottom douping- Differentiate mock leno and huck- a- back and compare their draft and lifting plan- Importance and general characteristics of Jacquard designs- Steps involved in the reproduction of Jacquard design from Jacquard cloth- Steps involved in the reproduction of Jacquard design from motif designs

MODULE IV – 10 MARKS (WEAVING PREPARATION AND PRIMARY MOTIONS OF POWER LOOM)

Objectives of Warp Winding- Understand the Working of Warp Winding Machines - Creel - types of tensioners - slub catchers - Broken thread stop motion - Full package stop motion - ribbon breakers - Package arm holders - traversing mechanism - features of Disc and Gate type tensioners - working of Electronic Yarn clearers - Warp Winding -Drum Winding and Precision winding - advantages of Electronic yarn clearers over ordinary slub catchers - Angle of wind - wind ratio - types of knots - splicing - Roto Coner - Auto Coner - defects in winding - causes & remedies Weft Winding Machines – Objectives - High-speed automatic pirn winder - Bunching mechanism - Layer locking device - Pirn diameter control - defects in pirns, their causes and remedies.

Objectives of warping - beam warping and sectional warping - Ruti high-speed warper - functions of various components of a warping machine – Creel, Thread stop motion, Length measuring motion, Headstock, Expanding Comb, Doffing motion, Brake Motion, Driving Drum, Tensioners - Sectional warping machine -limitations of sectional warping -Defects in warp beams, their causes and remedies Objectives of sizing - Ingredients used in the size paste and their functions - Multi cylinder sizing machine - functions of the various controls in

a modern a sizing machine-Temperature, Size level, Stretch, Moisture, Viscosity -size recipe for coarse, medium and fine cotton yarns-Defects in sized beams, their causes and remedies - Precautions to be taken for sizing synthetics and blends - improved fibre lay - after waxing - objectives of drawing- in and denting – Role of Healds and Reeds - Selection of suitable healds and reeds for different fabrics.

Passage of material through a power loom- various parts and functions – Primary, Secondary and Auxiliary motions and role of each in weaving- Importance of Primary Motions. Principles of Shedding- Positive and Negative Shedding - Early shedding and late shedding - selection of shedding mechanism- Tappet Shedding- Dobby Shedding- Jacquard Shedding - Different types of Sheds. Working of Plain Tappet Shedding mechanism - Setting and timing of plain tappet Shedding – Function of counter shaft Picking- objectives - Positive Picking and Negative Picking- Working of Cone Over Pick motion- Working of Under Pick motions- Method of Altering Picking Force and Setting of Picking band- Timing and Setting of Cone Over Picking - Working of beating mechanism – Calculation of eccentricity of the sley

MODULE V – 10 MARKS (THE MECHANISM OF WEAVING)

Secondary motions - take up motions - 7 wheel take up motion - continuous and intermittent take up motion- Let off motions- working of a negative let off motion, working of positive let off motions (Ruti – Ropper)- auxiliary motions-Side weft fork and centre weft fork motions- working of side weft fork motion- timing and setting of side weft fork motion-objectives and types of warp stop motions - working of a mechanical warp stop motion used in 'Sakamoto' looms - working of electrical warp stop motion - objectives and types of warp protector motions- working of loose reed motion -the working of fast reed motion- the objectives of brake motions-the working of brake motion- the objectives and general description of check strap- the objectives and general description of Temples

Various classifications of dobby shedding mechanisms- dobby designs- method of the pegging of lags for L.H and R.H dobbies – working of Keighley dobby and its limitations- timing and setting of Keighley dobby, advantages of double jack dobby over single jack dobby-working of Climax dobby- -use of Cross Border dobby-working of Cross border dobby-working of Ruti Cam dobby -working of Knowles positive open shed dobby-functions of heald levelling device and steadying mechanism in dobby.

Advantages of Jacquard shedding-basic principle of Jacquard shedding-list the parts & functions of jacquard -harness mounting like London and Norwich systems- define harness ties and various types of harness ties like straight tie, centre tie, mixed tie- count of comber board - First hook and First needle of the jacquard - various classifications of Jacquards - Single lift Jacquards, Double Lift Jacquards, Single Cylinder Jacquards, Double Cylinder Jacquards, Cross border Jacquard - working of Single Lift Jacquards, working of Double Lift Single Cylinder Jacquard-working of Double Lift Double Cylinder Jacquard- working of Cross Border Jacquard- -construction and development of Jacquard designs-working of Piano card cutting machine-card punching and card lacing-use of special Jacquards and the working of Pressure Harness. Study of textile CAD for woven designs – common features of textile CAD.

MODULE VI – 10 MARKS (ADVANCED FABRIC MANUFACTURE)

Type of box motions- Use of multiple box looms- Classification of multiple boxes- Dropbox vs. circular boxes- Skip Vs Nonskip- Pick at will/Pick and Pick. Working of Eccle's Dropbox motion- Study of card saving mechanism- Arrangement of pattern cards for various picking patterns Study of various positions of stud and pin when different boxes are in line with the slay race- Timing and setting. Working of Non- Skip type circular box motion- Object and classification of Terry motions Working of Dug dale's Terry motion- Working of Holden's Terry motion- Features of automatic looms Classification of automatic looms- Advantages of automatic looms- Compare automatic and nonautomatic looms. Working of midget weft feeler mechanism- Timing and setting. Working of automatic weft replenishment motion with respect to cop changing looms - Timing and settings. Shuttle protector –functions and uses. Different types of Thread cutters and their uses-Features of shuttle changing looms. Compare shuttle changers and cop changers.

Comparison of the advanced method of fabric production with conventional types of looms- Types of shuttle less looms- The basic requirement of shuttle less weaving- The advantages of shuttle less weaving machines. The principles and the various stages of weft insertion in Sulzer shuttle less weaving machine with 4 colour weft insertion -Torsion bar picking mechanism- The working of cam beat–up. The quality of Sulzer woven cloth- Warp and weft preparation for shuttle less weaving- Rapier shuttle less weaving-Various classifications of Rapier shuttle less looms- The merits, demerits and limitations of Rapier looms- The various stages of weft insertion in rapier looms- The picking mechanism in a flexible rapier loom (Rack and pinion type)-Features of different types of selvedge used in shuttle less weaving.

The features of Air Jet looms-The passage of warp yarn on Maxbo Air Jet loom- The functions weft insertion elements used in air jet looms-The various stages of weft insertion on Maxbo air jet looms- The basic features of water Jet looms- The 4 stages of weft insertion in water jet loom- The working of weft supply system on water jet looms-Mention the merits, demerits and limitations of water jet looms.

MODULE VII – 10 MARKS (PROCESS CONTROL AND MAINTENANCE IN WEAVING)

Importance of Production of good packages in weaving Preparatory – Determining the quality of knot - possible defects in cones - clearing efficiency and knot factor - quality factor of yarn clearer – effect of unwinding tension - measures to minimize end breaks in warping- conditions which influence the quality of warper's beam – the importance of length measuring motion - methods to improve productivity at Warp winding & Warping - objectives of process control in sizing - selection of size and size pick-up, control of size pick-up, method of controlling Yarn stretch & Moisture in sized yarn – possible defects in sizing - reasons for stoppages of pirn winding - methods to improve productivity Sizing & Pirn Winding – Effect of RH in Preparatory and weaving department.

Effect of reed parameters on weavability of yarn - measures to improve productivity in loom shed - steps for reducing loom stoppages - miscellaneous loom stoppages – control of loss of efficiency based on snap reading - procedure for loom allocation – methods to minimize waste in weaving shed – Various fabric defects and their causes and remedies.

Lubricants & bearings used for Textile machines -Definition and types of bearings- solid journal, split, needle, roller and ball bearings - selection of bearings for textile machines - objectives of lubricants - characteristics of lubricants- type of lubricants –solid, semisolid and liquid lubricants with examples - selection of lubricants.

Methods and objectives of levelling - Instruments used in levelling – spirit level, plumb line, wedge and spirit level, protractor - erection procedures for loom - erection tools and equipment.

Maintenance schedule for Winding, Pirn winding, Warping, Sizing, Plain & automatic Looms - Care and maintenance of loom parts - Heald, Reed, Picker, Picking band, Shuttle, Buffer, Temples, box spindle and check strap - defects due to improper maintenance of preparatory machines and looms - List the causes of defects and rectification

MODULE VIII – 10 MARKS (WEAVING CALCULATIONS)

Understand the different methods of Yarn Numbering Systems - -direct and indirect systems of yarn numbering - English, French, Metric, Denier, Tex - equations for calculating count in different Direct and Indirect systems - equations for calculating equivalent count -resultant count of folded yarn with and without contraction - average count (beam count)- Heald and reed count. Speed, production and efficiency of warp winding machines - weft winding machines, warping machines - sized yarn weight, un-sized yarn weight and size percentage - production, speed and efficiency of sizing machines.

Calculation of the production and efficiency of power looms- Evaluation of the time required for the exhaustion of the weavers beam- Evaluation of the time required for the exhaustion of a pirn, cone etc-Estimation of the number of pirns required for the loom in a given time- Estimating the number of pirns/cones required to produce a particular quantity of fabric- Computing the number of pirn winders required to feed a given number of looms- Estimating the number of warping machines required to feed the given number of looms- Calculations related to take up motions- Dividend Calculation- Calculations to find out the required standard wheel and change wheel- Find out the quantity of warp and weft required to weave a particular fabric.

MODULE IX – 10 MARKS (ELEMENTS OF TEXTILE TESTING)

Objectives of Textile Testing - Comparison of quality assurance and quality control - Selection of Sample for testing - population and individual in statistics - frequency table – Graphical representation of frequency distribution –Histogram, frequency polygon and frequency curve - types of frequency curves- Normal, Asymmetric, bi-modal, U-shaped - Measures of central Tendency – mean, median and mode - Measures of Dispersion – Range, Deviation, standard deviation, CV% - Humidity - expressions of humidity – Absolute humidity and relative humidity - Measurement of Humidity of the atmosphere by sling hygrometer – features of electronic hygrometers - Standard atmospheric condition, standard atmosphere and standard testing atmosphere – Expression of moisture in a textile material - Estimation of Moisture content and regain of Textile materials by conditioning oven and electronic moisture meter - Standard moisture regain of important textile fibres - Estimation of standard regain of a blend P/C, P/W, P/V and P/V/W- Moisture Hysteresis.

FIBRE TESTING- Properties of Textile fibres - Importance of fibre length - Fibre length parameters- EL, ML, SF, Dispersion, Span length, 2.5% and 50% span length, uniformity

ratio - determination of fibre length parameters by Baer sorter and Digital fibro graph - Importance of fibre fineness - Determination of fibre fineness by Sheffield Micronaire and ATIRA fibre fineness tester - Importance of fibre strength - Strength terminologies-Load, Breaking load, Stress, Mass stress, Tenacity, Strain, Elongation, Extension, Breaking extension, Load-elongation curve, stress-strain curve, young's modulus, yield point, yield stress, yield strain - Stress-strain curve for cotton, wool, silk, viscose rayon, nylon, polyester - Elastic properties, elastic recovery, elastic extension and permanent set - Estimation of fibre strength by Stelometer - Importance of fibre maturity - List the different methods of determination of fibre maturity - Estimation of fibre maturity by Caustic soda swelling method - Importance of FQI and its relation to lea CSP – Features of Advanced Fibre Information System [AFIS] - Features of High Volume Instrument [HVI] – Cleaning efficiency, Lint, Trash and invisible loss - Estimation of trash content in cotton by Shirley trash analyser.

MODULE X – 10 MARKS (YARN AND FABRIC TESTING)

Properties and characteristics of yarn - Importance of yarn count - Determination of yarn count by Knowles balance and Beesley's balance - The Importance of yarn strength – List the factors affecting yarn strength - Principles of tensile strength testing-CRL. CRE, CRS and CRT - Estimation of single thread strength by CRT and CRL principle - Lea strength tester - the importance of Yarn twist - Definition of twist, S twist, Z twist, twist on twist, weft on twist – Different methods of twist determination - Estimation of twist in yarn by tension type twist tester and take-up twist tester- Importance of evenness of the yarn – terms in evenness – the random variation, periodic variation, wavelength, amplitude, short, medium and long term period variations -Methods of determination of evenness - Yarn appearance grading by ASTM standard boards – Uster evenness tester - Classification of basic classimat faults – yarn hairiness - Determination of yarn hairiness by Shirley hairiness tester.

Fabric properties and characteristics - Dimensional properties of Fabric - Threads density - Fabric weight - Count of the yarn used for fabric manufacture - Determination of cover factor – Warp cover factor, Weft cover factor and Cloth cover factor - Crimp in yarn - Crimp percentage and crimp amplitude - Shirley yarn crimp tester - Definition of pill and causes of pill formation - Fabric strength - Determination of Fabric tensile strength by tester working on CRT principle - Elmendorf Tearing strength tester - Hydraulic bursting strength tester - Fabric abrasion resistance - Types of abrasions - Martindale abrasion tester - Fabric stiffness - Bending length, flexural rigidity and bending modulus - Cantilever principle - Shirley stiffness tester - Drape and drape co-efficient - Determination of drape by Drape meter - Crease property - Crease resistance and Crease recovery - Shirley crease recovery tester - Define air permeability - air permeability, air resistance and air porosity - Shirley air permeability tester - Water permeability and water repellency - Bundesmann water permeability tester.

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.