

Name of Specialization: Textile Technology

No. of Question: 50 (Objective Type)

Duration: 1 Hr. 30 Min

Maximum Marks: 50

### **1. Textile Fibres and their Productions**

The method of manufacture and mechanism of polymerization techniques of polyesters, nylon, acrylics, Mod-acrylics, polyolifins, cellulosic fibres, viscose rayon and modified viscose rayons. Manufacturing process of staple fibres and multi filament yarn. Their properties and application areas. Principles of various texturing processes. Fibre modifications and evaluation of their properties. Advances in fibre extrusion processes and discussion on structure and properties of the product. Developments in post extrusion operations. New fibres based on performance and functional applicability. High temperature resistant fibres – Nomex, Kelvar, PBO – production, properties, structure and applications. High strength, high modulus fibres – Spectra (UHMWPE) – production, properties, structure and application. Different routes for production of carbon fibres, their structure, properties and end uses. Optical fibres – Different types, Signal losses, their remedy, production and properties their end uses.

### **2. Testing and Evaluation of Textile Materials**

Measurement of physical and tensile characteristics of fibres, yarns and fabrics; units used to express these properties. Characterization of Fibre: Birefringence, sonic modulus, density measurements, thermal analysis, Xrays (orientation and crystallinity). Testing of technical textile; coated fabrics, geo-textiles, filter fabrics. Comfort properties of fabric, water repellency. Computer colour matching, measurement of U-V protective character of textile material.

### **3. Technology of Yarn Production**

Objectives of various processes involved in the manufacturing of yarn from staple fibres. Design principles of various machines used for these processes. Theories of carding. Design aspects of high production cards. Drafting force. Theories of drafting. Mechanism of hook removal during drafting. Auto leveling. Combing-effect of lap preparation, fractionating efficiency of comber and its assessment, measurement and improvement, latest development in machine design. Developments in high speed fly frames. Twist flow in Ring Spinning, Spinning Tension. Developments in design of ring travelers. Spindles and high-speed ring frame. Automated Spinning. Compact spinning – mechanism and role of process variables.

### **4. Technology of Fabric Production**

Objectives of various processes involved in the manufacturing of fabrics. Design principles of various machines used for these processes. Theory, 30 measurement and control of yarn tension in unwinding from spinning packages during winding, Tension generators to control yarn tension. Development in design and operation of modern winding, warping, sizing machines. Theory and design principles of latest automatic controls in size regulation in sizing. Factors affecting size pick up and drying rate in sizing. Expression for drying capacity of sizing machine. Kinematics of loom slay. Picking system elastic model, shuttle checking. Cloth fell position and its applications, beam- driving mechanism, force acting at a floating back roller. Principles underlying unconventional weaving machinery picking system: toggle torsion bar picking, air jet nozzle, water jet nozzle, rapier drives. Kinematics of weft population in unconventional weaving machines: air drag theory i.e. air-jet flows, flow in air guiding system, analysis of yarn tension during unwinding of yarn from drum feeders, yarn flight in air-jet, analysis of yarn motion in air-jet. Loom timings for shuttle less looms.

## **5. Technology of Chemical Processing**

Introduction of Wet Processing. Objects of different processes involved e.g., singeing, desizing, scouring, bleaching. Processing sequence in conversion of Grey cotton goods into semi bleached, full bleached and color bleached fabrics. Machinery used in scouring and bleaching of cotton fabric. Dyeing: General method of dyeing by important classes of dyes on natural and manmade fibers e.g., direct, acid, basic, vat, azoic, Sulphur and disperse dyes. Finishing: Object of finishing and application of various type of finishes.

## **6. Technical Textiles**

Textile materials in technical applications. Fibres: Natural and Man-made fibres suitable for technical applications and their relevant properties. Geotextiles: Mechanics of reinforcement, filtration and drainage of soils by geotextiles. Typical applications. Determination of soil particle size and pore size distribution, relations between soil particle and size and pore size distribution for hydraulic applications. Medical textiles: Textiles in various medical applications. Absorbency of textile materials & methods of sterilization; application-oriented design of typical medical textiles (e.g. porous graft or trashed tube). Materials used and design procedure for protecting wounds, cardiovascular application, Sutures. Automotive Textiles: Fibres used for automotive applications- upholstery, carpeting, preformed parts, tyres, safety devices, filters and engine compartment items. Filtration: Principles and some mathematical models of wet and dry filtrations. Characteristics properties of fibres and fabrics in selective examples of filtration. Protective clothing: Thermal protection. Ballistic protection. Protection from electromagnetic radiation and static hazards. Protection against micro-organisms, chemicals and pesticides

## **7. Statistical Analysis**

Basic statistical tools. Introduction to geometrical, Binomial, Poission and normal probability distributions. Some standard significance tests-Test for a 31-single

mean-small and large samples. Test for the difference between two means. Test for the difference between two means: matched sample. Test for the difference between two variances.

Sampling techniques, sample size, Principles of experimental design. Response surface designs.

Statistical principles in data analysis. Fitting data. Linear regression with one, and several variables.

Polynomial models. ANOVA. Rank correlation, Coefficient of concordance. Sampling inspection. Acceptance sampling: OC curve, Acceptance sampling by variables, Producer risk condition. Control Chart: Average run length, Modified control limits for averages.