

Syllabus for Entrance Examination for admission to Ph D (Textile Technology)

Classification of textile fibres; Essential requirements of fibre forming polymers; Gross and fine structure of natural fibres like cotton, wool and silk. Introduction to important bastfibres; properties and uses of natural and man-made fibres; physical and chemical methods of fibre and blend identification and blend analysis. Molecular architecture, amorphous and crystalline phases, glass transition, plasticization, crystallization, melting, factors affecting T_g and T_m; Process of viscose and acetate preparation. Polymerization of nylon-6, nylon-66, poly (ethylene terephthalate), polyacrylonitrile and polypropylene; Melt Spinning processes, characteristic features of PET, polyamide and polypropylene spinning; wet and dry spinning of viscose and acrylic fibres; post spinning operations such as drawing, heat setting, tow-to-top conversion and different texturing methods. Methods of investigating fibre structure, structure and morphology of man-made fibres, mechanical properties of fibres, moisture sorption in fibres; fibre structure and property correlation. Yarn manufacture and yarn structure & properties: Principles of opening, cleaning and mixing/blending of fibrous materials, technology of carding, carding of cotton and synthetic fibres; Drafting operation, causes of mass irregularity introduced by drafting; roller arrangements in drafting systems; principles of cotton combing, combing efficiency, recent developments in comber; Roving production, roving twist; Principle of ring spinning, forces acting on yarn and traveler; ring & traveler designs; mechanism of cop formation, causes of end breakages; working principle of ring doubler and two for one twister, principle of non conventional methods of yarn production. Yarn contraction, yarn diameter, specific volume & packing coefficient; twist strength relationship in spun yarns; fibre configuration and orientation in yarn; cause of fibre migration and its estimation, irregularity index, properties of ring, rotor and air-jet yarns. Fabric manufacture and Fabric Structure, Principles of cheese and cone winding processes, yarn clearers and tensioners; different systems of yarn splicing; features of modern cone winding machines; features of modern beam and sectional warping machines; different sizing systems, sizing of spun and filament yarns, modern sizing machines; principles of pirn winding processes and machines; fabric appearance and weaving performance; shedding; mechanics of weft insertion with shuttle; warp and weft stop motions, warp protection, weft replenishment; functional principles of weft insertion systems of shuttle-less weaving machines. Principles of weft and warp knitting. Classification, production and areas of application of nonwoven fabrics. Basic woven fabric constructions and their derivatives. Peirce's equations for fabric geometry; elastica model of plain woven fabrics; thickness, cover and maximum sett of woven fabrics. Sampling techniques, sample size and sampling errors. Measurement of fibre length, fineness, crimp, strength and reflectance; measurement of cotton fibre maturity and trash content; HVI and AFIS for fibre testing. Measurement of yarn count, twist and hairiness; tensile testing of fibres, yarns and fabrics; evenness testing of slivers, rovings and yarns; testing equipment for measurement test methods of fabric properties like thickness, compressibility, air permeability, drape, crease recovery, tear

strength, bursting strength and abrasion resistance. FAST. Statistical data analysis of experimental results. Correlation analysis, significance tests and analysis of variance; frequency distributions and control charts. Mercerization. Preparatory processes for nylon, polyester and acrylic and polyester/cotton blends. Classification of dyes. Dyeing of cotton, wool, silk, polyester, nylon and acrylic with appropriate dye classes. Dyeing polyester/cotton and polyester/wool blends. Dye fibre interaction. Introduction to thermodynamics and kinetics of dyeing. Methods for determination of wash, light and rubbing fastness. Evaluation of fastness properties with the help of grey scale. Styles of printing. Printing thickeners including synthetic thickeners. Printing auxiliaries. Printing of cotton with reactive dyes. Printing of wool, silk, nylon with acid and metal complex dyes. Printing of polyester with disperse dyes. Methods of dye fixation after printing. Resist and discharge printing of cotton, silk and polyester. Printing of polyester/cotton blends with disperse/reactive combination. Transfer printing of polyester. Developments in inkjet printing. Finishing. Heat setting. Treatment of textile effluents.