MAJOR TEST: TTL232

Date 02.05.08 Full Marks: 40

Time: 1300-1500h

(Answer the questions of Group-I and Group-II in separate answer sheets)

Group-I: Shuttleless Weaving and Knitting

Q1 It is desired to produce a warp knitted mesh of size 0.5 cm x 0.5 cm employing one guide bar executing a lapping plan of 1 0// and a magazine weft insertion system. What type of machine should be chosen and what should be the gauge of the needle bar if the fabric does not exhibit any width way shrinkage? Justify your answer. (3 x 2)

Q2 Draw a sectional view of the nozzle of an air jet weft insertion system & explain as to how the pressure energy of air gets converted into kinetic energy. Also mention the condition necessary for the sucking-in of weft into the yarn duct of the nozzle. (3+1)

Group-II: Nonwovens

Q1 Parallel laid nonwoven webs are produced from a carding machine. How the anisotropic characteristics of carded webs can be modified such that these structures have relatively uniform properties in various test directions? (3)

Q2 State whether the following statements are true or false and justify your answer. (3x4)

a. Air laid web is having a higher compressional resistance in comparison to a perpendicular laid web.
b. Strength of a needlepunched fabric is always higher than the corresponding thermal bonded fabric.
c. In a melt blown process, fibres are laid in the machine direction at a steeper air-angle.
d. Cone-up nozzle geometry can yield better energy transfer in comparison to the cone-down shaped nozzle in a hydroentanglement process.

Q3 Illustrate with the help of a diagram, how the self-locking type of needlepunched structure can be produced and what is the role of pegs in a needlepunched fabric? (2+1)

Q4 Explain Clapeyron effect and how the bond formation takes place in a thermal bonded structure. (1+1)

Q5 Calculate the throughput rate per nozzle (g/min), production (kg/h/m) and deposition ratio in a spunbonding process having a screw of diameter 1 inch and rotating at a speed of 10 rpm. The diameter of the nozzle is 0.1 cm and it is extruding polypropylene (melt density of 750 kg/m^3) of web areal density of 50 g/m^2. Assuming there are 3 nozzles per unit cm working width and the filament speed is 40 m/min. (2+1+1)

Q6 Calculate the weight per unit area in g/m^2 of a carded web consisting of 20 μm diameter bicomponent fibres. The bicomponent fibre consists of polypropylene (sheath) and polyester (core) in the weight ratio of 80/20, respectively. Assuming the carded web weight is a function of fibre denier (*N*), i.e. $w = k\sqrt{N}$ where *k* is the coefficient for the card with given speeds and settings. The value of *k* is kept constant, i.e. 17 for a given card with given specifications and speeds. The densities of polypropylene and polyester are assumed to be 0.91 and 1.38 g/cm^3. (3)

Q7 Calculate the specific energy coefficient for expected fabric tensile strength in the machine and cross-machine directions to be 50 N/60 mm and 100 N/60 mm, respectively. Assume that the specific energy consumed by a unit mass of polyester fibres is 1.2 MJ/kg and the web areal density is 50 g/m^2. Also give the significance of specific energy coefficient in a hydroentanglement process. (2+1)