

[Total No. of Questions - 9]  
(2063)

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845

B.Tech 4th Semester Examination

Man-Made Fibres

TE-4002

Time : 3 Hours

Max. Marks : 100

*The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.*

**Note :** Attempt FIVE questions in all, selecting one question from each section. Section E contains only one question which is compulsory.

**SECTION - A**

1. (a) Differentiate a fibre from a filament and a multifilament from a tow.  
(b) In what ways natural fibres are advantageous over man made fibres or vice-versa?  
(c) List the factors influencing thread line.  
(d) Compare different techniques of quenching. How do these affect filament structure? **(5 each)**
2. (a) Describe the design and working of an Extruder.  
(b) How is the spinning system i.e. Melt spinning, dry spinning or solution wet spinning selected?

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[P.T.O.]

- (c) Specify the differences in the production of 'POY', 'MOY' and 'FDY' and the reasons for these differences. **(8+5+7)**

### **SECTION - B**

3. (a) Draw flow charts showing the production of polyester fibres through PTA as well as DMT routes and explain in brief.
- (b) Which of the two routes i.e. PTA and DMT is advantageous and why?
- (c) Mention the side reactions that occur during polyester formation/manufacture. **(10+5+5)**
4. (a) How is caprolactum synthesized?
- (b) Discuss the polymerization of caprolactum.
- (c) List the precautions to be taken during dope formation, extrusion and solidification of filaments of nylon and acrylics. **(5+7+8)**

### **SECTION - C**

5. (a) What is the role of comonomers during production of acrylic fibres. List different types of comonomers which are used in general.
- (b) Highlight the influence of variables dictating the structure of acrylic fibres.
- (c) Explain Gel spinning in detail in reference to acrylic fibre. **(6+6+8)**
6. (a) Discuss in detail the chemistry of viscose rayon formation.

- (b) How do various additives and temperature of the regeneration both influence the properties of viscose rayon.
- (c) Differentiate Normal viscose, cuprammonium Rayon, High Wet Modulus rayon and Ten-X fibres. **(8+7+5)**

#### **SECTION - D**

- 7. (a) Discuss different types of spin finishes used and highlight their effects on downstream processes.
- (b) Outline the spinning mechanism of 'KEVLAR' fibres.
- (c) Describe the structure of Kevlar and Nomex fibres and list their applications. **(8+8+4)**
- 8. (a) Discuss various techniques for the production of 'Carbon' fibres.
- (b) How does the process of neck drawing influence the structure and properties of polyester and nylon filaments.
- (c) What is the importance of heat-setting during filament production? **(8+8+4)**

#### **SECTION - E**

- 9. (i) Enumerate the objectives of drawing operation used in fibre manufacturing.
- (ii) Does molecular orientation always result in crystallization? Explain.

**[P.T.O.]**

- (iii) What is 'deashing'?
- (iv) Explain in brief Dieswell phenomenon.
- (v) Where do we use manifold and why?
- (vi) Why spinning of polypropylene require a longer cooling zone?
- (vii) What is stress-induced crystallization?
- (viii) Differentiate nylon 6 and nylon 66.
- (ix) Define 'Oligomers.'
- (x) Why is blending of chips more critical for a filament yarn production than staple fibre production? **(10×2=20)**