

[Total No. of Questions: 12]

[Total No. of Printed Pages: 2]

UNIVERSITY OF PUNE

[4364]-273

B. E. (*Polymer Engineering*) Examination - 2013

(Polymer Composites and Blends)(2003 Course)

[Time: 3 Hours]

[Max. Marks: 100]

Instructions:

- 1 *Answers to the two sections should be written in separate answer-books.*
 - 2 *Draw neat diagrams wherever necessary.*
 - 3 *Numbers to the right indicate full marks.*
 - 4 *Assume suitable data, if necessary.*
 - 5 *Use of logarithmic tables, electronic pocket calculator is allowed.*

SECTION -I

- | | | | |
|-----|---|---|----|
| Q.1 | A | Discuss the role of polymeric modifier for achieving improvement in the Processability, Impact Strength, Heat Deflection temperature and Chemical Resistance of the polymer blends. | 8 |
| | B | Discuss in detail the Engineering Polymer Blends with one example. | 10 |

QR

- Q.2** A Discuss any five terminologies used in Polymer bend technology. 6
 B Discuss with one example how to achieve the selection of the polymers to prepare the polymer blends 6
 C State material and processing related reasons of Polymer Blending. 6

Q. 3	A	Distinguish between Coupling agent Vs Compatibilization.	8
	B	Discuss with the example the principle of Reactive Compatibilization	
Q. 4	A	State and explain any three functions of Compatibilization	8
	B	Write a note on Mechanism of Compatibilization	
Q. 5	A	Write a note on the following	16
	i)	Commercial Blends of PP.	
	ii)	Commercial Blends of PS.	
	iii)	Commercial Blends of PC.	
	iv)	Commercial Blends of ABS.	
Q. 6	OR		
	A	Explain the following: i) Semi-IPN, ii) Sequential-IPN.	8
	B	Discuss application of Interpenetrating polymer network	8

SECTION II

Q. 7	A	How reinforcements are classified? Explain in brief about nature fiber used in polymer composite.	10
	B	What are essential properties necessary for resin to use in composite? Explain various epoxy resin used in polymer composite.	
Q. 8	OR		
	A	Discuss in detail the different types of matrices used in FRP. Explain the role of adhesion promoters in FRP.	8
	B	Explain the role of Mold Release Agent in FRP.	10
		Discuss in detail the different types of reinforcements used in FRP	
Q. 9	A	Explain with neat sketch Pultrusion process.	8
	B	State & explain effect of process parameter on quality of filament winding process	
Q. 10	OR		
	A	Explain in detail any one technique used in preparation of composite.	10
	B	Trouble shooting in Hand Lay Up Technique.	6

UNIVERSITY OF PUNE
[4364]-278
B. E. (Polymer)
Advanced Polymer Rheology
(2003 Course)

Total No. of Questions : 12 **[Total No. of Printed Pages :3]**
[Time : 3 Hours] **[Max. Marks : 100]**

Instructions :

- (1) Answer 3 question from section-I and 3 question from section-II
- (2) Answers to the two sections should be written in separate answer-books.
- (3) Neat diagram must be drawn wherever necessary.
- (4) Black figures to the right indicate full marks.
- (5) Your answer will be valued as a whole.
- (6) Assume suitable data, if necessary.

SECTION-I

Q1.

- a) Define Newtonian and Non-Newtonian Fluids with egs. [8]
- b) Explain what are tensors and how can they be used to study rheology
Explain using stress tensor as well as strain tensors. [10]

OR

Q2.

- a) Explain and derive continuity equation [10]
- b) Explain and derive either Cauchy equation or Navier-Stoke equation. [8]

Q3.

- a) Derive the equation of shear stress as well as shear strain for flow through circular c/s. [10]
- b) Define power law model as well as well as Elli's model [6]

OR

Q4.

- a) How can one determine if the flow is lawinar or turbulent. How can one do turbulent flow analysis [8]
- b) Explain Ryan Johnson principle & what is its significance. [8]

Q5.

- a) Explain creep as well as stress relaxation with its significance. [8]
- b) Give the z mechanical elements used in Maxwell model and derive the model [8]

OR

Q6.

- a) Derive Voigt model for stress relaxation as well as creep condition [8]
- b) Explain Doi-Edward theory. [8]

SECTION-II

Q7.

- a) Give the effects of temperature as well as molecular weight & its distribution on viscosity [6]
- b) Give the effect of crystallinity and branching on viscosity [6]
- c) What is zero shear viscosity. Also explain the effect of plasticiser on viscosity [6]

OR

Q8.

- a) Give the effect of copolymerisation as well as different types of fillers on melt viscosity [10]
- b) Give the effect of polymer blench on rheology & thus viscosity. [8]

Q9.

- a) What are the different types of of rheometers. Explain oscillatory cone and plate Rheometer with its working. Also explain how this rheometer is used to find normal stresses. [10]
- b) Derive shear stress and shear strain equations for cone & plate viscometer. [6]

OR

Q10.

- a) Explain shear flow as well as Couette flow. How can concentric rotation rheometer be used to find viscosity. [8]
- b) Explain the viscometer that is used to find the rate of rubbers [8]

Q11.

- a) Explain the process of calendering as well as two roll mill [8]
- b) Explain the different types of internal mixers [8]

OR

Q12.

- a) Explain the influence of single screw as well as twin screw on viscosity [8]
- b) Explain blow molding process & the role of viscosity during the process. [4]
- c) Explain thermoforming process & the role of viscosity during the process. [4]

UNIVERSITY OF PUNE

[4364]-275

B.E. (Polymer engg)

Examination – 2013

**Polymer Reaction Engineering
(2008 Pattern)**

Total No. of Questions : 12

[Total No. of Printed Pages : 2]

[Time : 3 Hours]

[Max. Marks : 100]

Instructions :

- (1) Answer three questions from section I and three question from section II.
 - (2) Answers to the two sections should be written in separate answer-books.
 - (4) Neat diagrams must be drawn wherever necessary.
 - (5) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
 - (6) Assume suitable data, if necessary.
-
-

Section I

Q1. a) Explain the importance of Polymerization reaction engineering. [9]

b) Discuss the importance of molecular weight and Molecular weight distribution of Polymer. [9]

Or

Q2. a) Explain the role of residence time distribution and the concentration history in Polymerization reaction. [9]

b) Discuss the distinction between chain polymerization Vs Step polymerization based on kinetics. [9]

Q3. a) Discuss the effect of initiator concentration on average molecular weight of polymer. [8]

b) Derive the necessary relationship obtained in giving Molecular weight distribution in Batch for free radical type polymerization. [8]

OR

Q4. a) Discuss in detail Molecular weight distribution obtain via chain growth polymerization. [8]

b) Derive the model to find the rate of polymerization in case of emulsion polymerization. [8]

Q5. a) Discuss the model to find the rate of polymerization in case of emulsion polymerization. [16]

OR

Q6. a) Estimate a model for predicting rate of propagation in irreversible step growth polymerization at high conversion level where diffusion effect is predominates.

Section II

Q7. a) Write a short note on reactor systems used for PET, PVC, HDPE polymers. [18]

OR

Q8. a) Give technology overview for the following polymer [18]
i) SBR rubber. ii) Nylon6 iii) Polystyrene.

Q9. a) Discuss the MWD and reactor choice in polymerization process. [8]
b) Write a note on gel effect in step growth polymerization. [8]

OR

Q10. a) Discuss the conclusion from kinetics studies in free radical polymerization [8]
b) Write a note on gel effect in chain growth polymerization [8]

Q11. a) Explain in detail design of polymerization reactor as different as that of monomer producing reactor in respect of process control of different parameters. [8]

b) Discuss in detail the control problem in polymer reactor. [8]

OR

Q12. a) Discuss typical reactor used for finishing stage in step growth polymerization. [8]

b) Discuss the choice between batch and continuous reactor for polymerization process. [8]

UNIVERSITY OF PUNE
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B. E. (Polymer) Sem-I
Rubber Technology
(2003 Course)

Total No. of Questions : 12 **[Total No. of Printed Pages : 3]**
[Time : 3 Hours] **[Max. Marks : 100]**

Instructions :

- (1) Answer any 3 question from each section.
 - (2) Answer 3 question from Section-I and 3 question from Section-II
 - (3) Neat diagram must be drawn wherever necessary.
 - (4) Black figures to the right indicate full marks.
 - (5) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
 - (6) Assume suitable data, if necessary.
-

SECTION-I

Q1.

- a) How are rubbers classified? What is the basis for their classification?
Discuss any two rubbers w.r.t their synthesis, properties and applications. [9]
- b) Explain the thermodynamic theory for rubber elasticity. [9]

OR

Q2.

- a) Define „compounding’ list various ingredients used in rubber compounding.
Give the role of any 5 ingredients with suitable examples [9]
- b) What is vulcanization? Explain the process of vulcanization giving chemical reactions of at least 3 commercial elastomer material [9]

Q3.

- a) Show the various steps in dry rubber technology with the help of a block diagram. Discuss each step. [8]
- b) List the molecular criteria for a material to behave as an elastomer. [8]

OR

Q4.

- a) Explain the various stages involved in latex technology. [8]
b) Explain the process for manufacture of ribbed smobed sheet & pale crepe [8]

Q5.

- a) What is mastication? Why is it necessary? Discuss the mastication curve for natural rubber. How is mastication carried out? [8]
b) What are the different techniques of vulcanization? Discuss giving merits and demerits. [8]

OR

Q6.

- a) What is the role of the following ingredients in rubbers? Give examples and their mechanism of functioning. [8]
1) Antioxidants
2) Plasticisers
b) Explain the properties of C-black w.r.t structure, particle porosity, physical nature of the surface, chemical nature of the surface and surface area. [8]

SECTION-II

Q7.

- a) Explain the process for manufacturing of rubber hoses which rubber are used in the manufacture of hoses? Also list the various types of reinforcements used. [9]
b) List the 3 types of tyre constructions and explain the difference between them. [9]

OR

Q8.

- a) Define “cellular rubbers” classify cellular rubbers and explain. [9]
b) With the help of a neat sketch explain the major components of a cable. Explain the process for manufacture of cables. [9]

Q9.

- a) Explain the process of injection molding of rubbers. State its advantages and disadvantages. [8]
b) List the different types of extruders used w.r.t rubbers. Explain ,ram extruders used w.r.t rubbers. [8]

OR

Q10.

- a) What is “Flashes method” for manufacture of rubber articles. [8]
- b) Explain the different types of roll arrangements used in a calendar. What is role-bending in case of calendering? [8]

Q11.

- a) What is the need for testing of rubbers? How are the rubber test specimens prepared? List the test carried out on unvulcanised rubber. Explain any one of them. [8]
- b) What is “rebound resilience”? How is the test carried out? What is the effect of compounding on rebound resilience? [8]

OR

Q12.

- a) List the various electrical tests carried out on rubbers. Explain surface resistivity or volume resistivity w.r.t rubbers. [8]
- b) State any two applications in which the rubber product is tested for abrasion. Explain the procedure to carry out the test. [8]

UNIVERSITY OF PUNE
[4364]-271
B. E.(Polymer) Examination – 2013
POLYMER STRUCTURE & PROPERTY
RELATIONSHIP
(2003 Pattern)

[Time : 3 Hours] [Max. Marks : 100]

Total No. of Questions : 12

[Total No. of Printed Pages : 4]

Instructions :

- (1) Answer *any three* questions from each section.
 - (2) Answers three questions from **Sections I** and three questions from **Section II**.
 - (3) Neat diagrams must be drawn wherever necessary.
 - (4) Black figures to the right indicate full marks.
 - (5) Your answers will be valued as a whole.
 - (6) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
 - (7) Assume suitable data, if necessary.
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SECTION I

Q1) a) What is meant by the following terms: [06]

Spherulite, lanulla and fringed micelle model. How do they get affected by crystallinity?

b) Explain the role of plasticisers and how it influences the properties of a polymers. [06]

c) What is meant by 1st and 2nd order transition in polymers? [06]

OR

Q2) a) Out of Nylon 6, 6 and Nylon 6, 10 which is more hygroscopic and why? [06]

- b) What is the relation between crystallization and orientation in polymers. [06]
- c) How does structure affect flexibility in polymers? [06]
- Q3) a) Show the effect of molecular weight on thermal properties with the help of a plot of temperature versus modulus. [08]
- b) What is the effect of substituent on the glass transition temperature of polymers. Explain with example. [08]

OR

- Q4) a) Discuss the effect of tacticity on the properties of polymers. [08]
- b) What is the effect of crystallization on optical, chemical and electrical properties of polymers? [08]
- Q5) a) With the help of a plot of any mechanical property various testing time explain the significance of WLF equation [08]
- b) What is the requirement of molecular weight of a polymer in the various processing techniques? Discuss with help of any four processing techniques. [08]

OR

- Q6) a) What factors lead to conductivity in a polymers? Explain dielectric property and factors affecting them. [08]
- b) What is the effect of various additives on the end properties of a plastic compound? [08]

SECTION II

- Q7) a) What are the thermodynamic forces affecting crystallization? [09]
- b) Explain the structural features that resist internal rotation in polymers. [09]

OR

Q8) a) Enlist important electrical properties and how are they affected by polar Structures and crystallinity in case of polymers. [09]

b) A polymeric fiber / coating is to be used for preservation of fruits and vegetables? What sort of barrier properties the polymers should have? Suggest some polymers which meet this requirement. Explain factors affecting berries properties of the polymer. [09]

Q9) a) PE and PP are flexible, while PVC is rigid. Explain [06]

b) Explain why syndiotactic PS^1 has melting point of $240^0 C$ and atactic PS^1 has melting point only $100^0 C$. [04]

c) Can any polymer be 100 % crystalline or 100 % amorphous . Justify. [06]

OR

Q10) a) Explain the type of bonds carbon atom makes with other atoms and hence the properties attained. [08]

b) Discuss the kinetic factors affecting the rate and extent of crystallization. [08]

Q11) a) Write short notes on: (any 3) [16]

- i) Solubility parameter
- ii) Crosslinking in polymers
- iii) Polymeric foams
- iv) Effect of molecular weight on permeability and swelling.

OR

Q12) a) Write short notes on: (any 3) [16]

- i) Semicompatible Polymer blends

- ii) Effect of intermolecular bonding upon polymer properties
- iii) Orientation and its effect on polymer properties
- iv) London Dispersion Force.

B.E, (Polymer)
Examination - 2013
(2008 Pattern)

Polymer Processing Operation

Total No. of Questions: 12

[Total No. of Printed Pages :2]

[Time : 3 Hours]

[Max. Marks : 100]

Instructions :

- (1) Question No1. And Q no.5 are compulsory. Out of the remaining, solve any 2 from section I and section II.
 - (2) Answers to the 03 section should be written in separate answer books.
 - (3) Figures to the right indicate full marks. (4) Neat diagrams must be drawn whenever necessary.
 - (5) Use of logarithmic tables slide rule, Mollier charts, Electronic packet calculator and steam tables is allowed.
 - (6) Assume suitable data, if necessary.
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Section I

Q1. Write short notes on any 3: [18]

- a) Die shaping in blow molding
- b) Faults and remedies in blow molding of HDPE and PVC
- c) Plug assist vacuum forming
- d) Die swell in convergent and divergent die and mandrel assembly

Q2. A) Discuss guiding principle of design of cup and pin (die and mandrel) in case of blow molding. [8]

B) Describe constructional feature of flat film die. Explain complete line for sheet extrusion. [8]

Q3. A) List the different types of calibrators used in pipe extrusion. Discuss any one in detail. [8]

B) Explain the relevance of theology of and applications thereof of convergent and divergent. [8]

- Q4. A) List the rheological models used to analyze sheet stretching during thermoforming. [4]
B) Write in short about texturing with reference to thermoforming. [4]
C) Discuss the effect of following parameters on quality of blow molded containers. [8]
i) Change in melt temperature
ii) Change in output
iii) Change in die swell
iv) Die head pressure

Section II

- Q5. Write short notes on any three: [18]
a) Reaction injection molding
b) Stuffing box design and its application on injection molding of DMC
c) Design features of injection molded products.
d) Defects in compression molded products.
- Q6. A) Explain the principle and different methodology of injection molding over fabric, textile used in automobile industry. [8]
B) Discuss different torpedo design for obtaining patterns. Discuss also the injection sequences to obtain specified patterns. Explain also applications and pattern designs popularly available. [8]
- Q7. A) Discuss integral pot and separate pot method of transfer molding with neat figures. [8]
B) Explain the role of breathing in compression molding. [8]
- Q8. A) Explain the effect of tonnage requirement with reference to integral pot method and separate pot method. [8]
B) Discuss with reference to multicolor/ multicomponent / multimaterial injection molding machines [8]
i) Application
ii) Cycle time
iii) Principle of melt adhesion between different materials
iv) Different machine layout. [8]

[Total No. of Questions: 12]

[Total No. of Printed Pages: 3]

UNIVERSITY OF PUNE

[4364]-274

B. E. (*Polymer*) Examination - 2013

Mold And Die Design (2003 Course)

[Time: 4 Hours]

[Max. Marks: 100]

Instructions:

- 1 *Answers to the two sections should be written in separate answer-books.*
 - 2 *Draw neat diagrams wherever necessary.*
 - 3 *Assume suitable data, if necessary.*
 - 4 *Numbers to right indicate full marks.*
 - 5 *Use of log tables, electronic pocket calculator is allowed.*

SECTION -I

- Q.1 Design a 2 cavity 2 plate molds for the component shown in figure 1. Draw at least 2 views with one sectional view to bring out the details of the feed, cooling and ejection system. Illustrate the relevant design calculations. 35

OR

Q.2 Design a 2 cavity 3 plate molds for the component shown in figure 2. Draw at least 2 views with one sectional view to bring out the details of the feed, cooling and ejection system. Illustrate the relevant design calculations.(Fig. 1 & 2 on page 2) 35

Q. 3 Calculate the size of core and cavity inserts for the mold designed in question 1 or question 2. 5

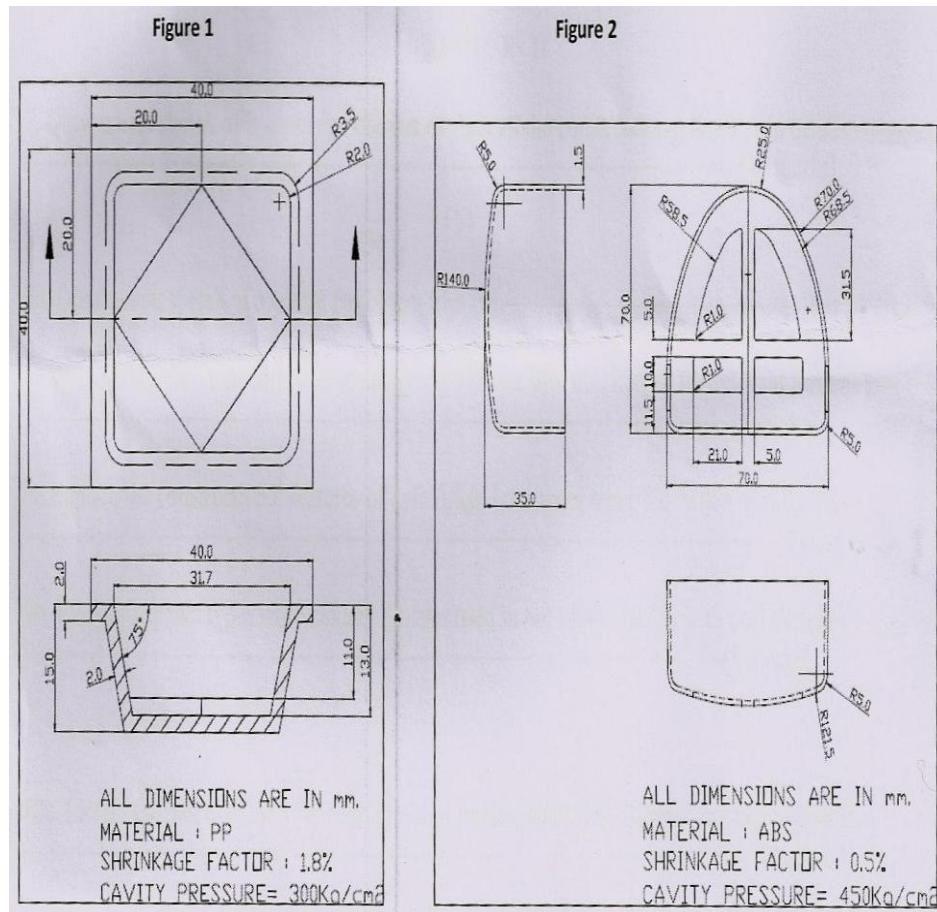
OR

Q. 4 Write the bill of materials for the component designed in question 1 or question 2. 5

Q. 5 Explain finger cam actuation for splits with neat figures. 10

OR

Q. 6 List all the mechanisms used for split safety. Explain any one in detail. 10



SECTION II

Q. 7 Draw a neat sketch of in-line pipe die and explain all the constructional features in details. 18

OR

Q. 8 A Draw a neat sketch of a centre fed blown film die. 9

B Write down the steps followed in designing a blown film die. 9
List all the relevant formulae.

Q. 9 A Explain the constructional features of cylindrical hot runner manifold with a neat figure. 8

- B Explain any two types of secondary nozzles used in hot runner molds with neat sketches. 8

OR

- Q. 10 A List all the methods used for heating of hot runner manifolds. 8
Explain any two in details.

- B Explain with a neat sketch, constructional feature of any two valve systems used with secondary nozzles. 8

- Q. 11 A Write down the process sheet for manufacturing of sprue bush and locating ring for the mold designed in question 1 or question 2. 8

- B Explain the wire cut EDM process with a neat figure. List the process parameters and their effect on machining. 8

OR

- Q. 12 A Write a note on mold costing. 8

- B Write down the process sheet for manufacturing of spacer blocks and ejector plate. 8

[Total No. of Questions: 12]

[Total No. of Printed Pages: 3]

**UNIVERSITY OF PUNE
[4364]-277**

B. E. (Polymer), Examination - 2013

SURFACE COATING AND ADHESIVES(ELECTIVE-I) (2003 Course)

[Time: 3 Hours]

[Max. Marks: 100]

Instructions:

- 1 Answers to the two sections should be written in separate answer-books.
 - 2 Black figures to the right indicate full marks.
 - 3 Neat diagrams must be drawn wherever necessary.
 - 4 Use of, electronic pocket calculator is allowed.
 - 5 Assume suitable data, if necessary.
 - 6 Answer any three questions from Section I and any three questions from Section II

SECTION -I

- | | | |
|------|---|----|
| Q.1 | (A) Explain the following terms – Varnish, Enamel, Lacquer | 6 |
| | (B) With suitable Examples give various ingredients as well as their role in paint formulation | 12 |
| OR | | |
| Q.2 | (A) Explain the process of film formation in case of paint. | 6 |
| | (B) In detail explain the classification of oils used in surface coatings | 5 |
| | (C) Comment on the molecular features required in surface coating to obtain Exterior durability, Adhesion and Corrosion resistance. | 7 |
| Q. 3 | (A) Explain any one method of paint application. | 8 |

- (B) Write short note on Emulsion paints and Silicone paints 8
- OR
- Q. 4 (A) Along with applications discuss in detail paints based on alkyd resins. 8
- (B) Write a short note on Epoxy Paints and Acrylic Paints. 8
- Q. 5 (A) Write short note on testing of paint for optical as well as mechanical properties. 10
- (B) Explain in detail manufacturing of paint. 6
- OR
- Q. 6 (A) Write short note on Health and Safety aspects in Paint Industry. 8
- (B) Explain in detail testing of paint for weathering resistance and package stability. 8

SECTION II

- Q. 7 (A) What are various theories of adhesion? Explain one in detail. 10
- (B) With reference to adhesion file explain the following terms – spreading coefficient, surface tension, equilibrium contact angle, spreading pressure. 8
- OR
- Q. 8 (A) Mention the vantage and limitations of adhesive bonding. 9
- (B) Enlist various guidelines to achieve good adhesion. 6
- (C) What do you understand by the term Work of Adhesion? 3

- Q. 9 (A) Discuss structure-property relationship in adhesives. 8
(B) Write a short note on Pressure Sensitive adhesives. 8
- OR
- Q. 10 (A) Write a short note on Hot melt adhesives and Reactive adhesives 10
(B) Explain in detail adhesives formulations based on natural product. 6
- Q. 11 (A) Write short note on Surface Pretreatment, its necessity and methods of surface treatment in adhesive field. 10
(B) Explain in detail testing carried out for peel strength of adhesive joint. 6
- OR
- Q. 12 (A) Explain the testing of adhesive for Track and Viscosity properties. 8
(B) Write short note on surface characteristics of various surfaces. 8

[Total No. of Questions: 7]

[Total No. of Printed Pages: 2]

UNIVERSITY OF PUNE

[4364]-279

B.E. (Polymer) Examination – 2013

PRODUCT DESIGN AND COMPUTER APPLICATIONS

(2003 Course)

[Time: 4 Hours]

[Max. Marks: 100]

Instructions:

- 1 Answers to the two sections should be written in separate answer-books.
- 2 Black figures to the right indicate full marks.
- 3 Neat diagrams must be drawn wherever necessary.
- 4 Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

SECTION -I

- Q.1 A Explain isometric and isochronous curves. How are isometric and isochronous curves used for plastic product design? 8
B Illustrate Zenner model for stress relaxation and creep. 8

OR

- Q.2 A Explain the concurrent design method. State its advantages and disadvantages. 8
B Explain the process of understanding of end user requirements and material selection in plastic product design. 8

- Q. 3 A Discuss Munsteadt model. State its merits and demerits. Explain physical significance of the model constants. 8
B Explain runner balancing and gate balancing in details. 8

OR

- Q. 4 A Discuss Ellis model. State its merits and demerits. Explain physical significance of the model constants. 8
B Discuss flow leaders and flow deflectors related to design of injection molded products. 4
C Write a note on fill analysis. 4

- Q. 5 A Write a note on press fit and snap fit assembly technique used in plastics. 9
B The engineering constants for orthotropic lamina in principle material directions are given below:

$$E_1 = 120 \text{ GPa}$$

$$E_2 = 80 \text{ GPa}$$

$$\text{Poisson's ratio} = \nu_{12} = 0.2$$

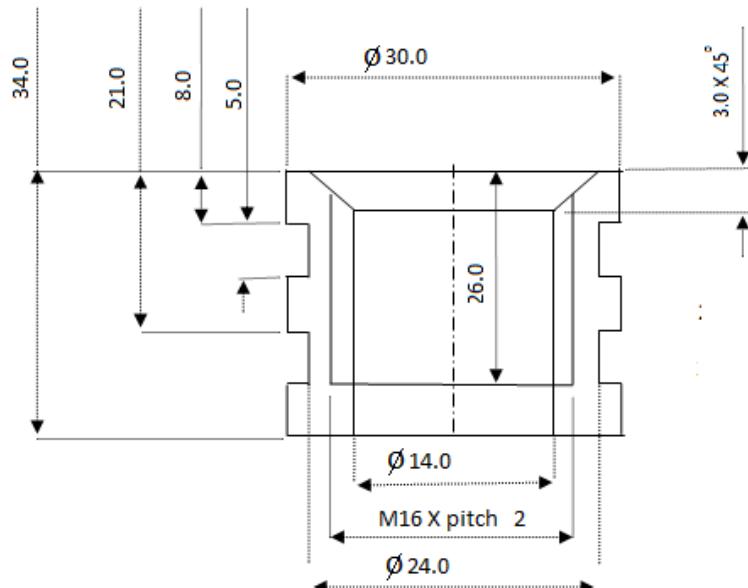
Calculate the transformed reduced stiffness if the angle of fibre orientation in 60° .

OR

- Q. 6** A Write notes on any three. 9
- (i)Tsai-Wu failure theory
 - (ii)Classical lamination theory
 - (iii)Maximum stress theory
 - (iv)Maximum strain theory
- B Give stress strain relationships for isotropic materials in terms of engineering constants for plane stress condition. 4
- C Express compliance matrix in terms of engineering constants for orthotropic materials. 5

SECTION II

- Q. 7** A Design and draw a 2 cavity mold for component shown in figure 35
1. Draw at least 2 views to bring out the details of feed, cooling and ejection system.



ALL DIMENSIONS ARE IN mm.

MATERIAL :ABS

SHRINKAGE FACTOR :0.5%

CAVITY PRESSURE=450 Kg/cm²

(FIGURE NO.1)

- B Explain the design for gears,cams if used. Give overall dimensions. 10
- C List the bill of materials. 5

[Total No. of Questions: 12]

[Total No. of Printed Pages: 2]

UNIVERSITY OF PUNE
[4364]-280

B. E. (Polymer), Examination - 2013
Polymer Processing Operations - II (2003 Course)
[Time: 3 Hours] [Max. Marks: 100]

Instructions:

- 1 Answer any three questions from Section I and any three questions from Section II
- 2 Answers to the two sections should be written in separate answer-books.
- 3 Neat diagrams must be drawn wherever necessary.
- 4 Black figures to the right indicate full marks.
- 5 Assume suitable data, if necessary.
- 6 Use of logarithmic tables, electronic pocket calculator and steam tables is allowed.

SECTION –I

Q.1	A	Discuss different heating system and different materials used in Calendering.	9
	B	Explain the significance of Friction ratio in Calendering. Explain various methodologies used for ensuring uniform thickness including roll shapes modifications.	
Q.2	OR		9
	A	Explain Calendering plant layout for making PVC Sheet.	
Q. 3	B	Explain Superimposed, Offset and Z-type Calender arrangement with neat diagram.	9
	A	Explain any two types of rotational molding machines.	
Q. 4	B	Explain the advantages of Liquid polymer rotational molding and discuss flow behavior of polymer during rotational molding.	8
	OR		
Q. 4	A	Derive necessary equation to find time taken to heat rotational mould.	8
	B	Explain Rotational Molding Of Nylon.	

Q. 5	A	Write a note on the followings: i) Vacuum metalizing process ii) Electroplating OR	16
Q. 6	A	Explain in detail Flexography Printing Process.	8
	B	Discuss different techniques of surface treatment and explain any one.	8

SECTION II

Q. 7	Explain in detail Melt Spinning Process with one example. Differentiate between Wet and Dry spinning and explain both in detail with examples. OR		18
Q. 8	A	Explain in detail effects of different process parameters on the quality of Nylon Fibers. What is texturising and how it is carried out.	18
Q. 9	A	List different methods of separation of plastic waste and explain any one in detail.	8
	B	Discuss in brief standards used for recycling of plastics. OR	8
Q. 10	A	Explain the process of PET Recycling with examples.	8
	B	Write a note on Incineration Process of plastic waste.	8
Q. 11	A	Discuss Theory and Mechanism of Adhesion Bonding.	8
	B	Explain Laser Machining of Plastics. OR	8
Q. 12	A	Write a note on Ultrasonic welding, Hot Gas Welding.	8
	B	Discuss Mechanical Fastening, Press Fit Assembly.	8

[Total No. of Questions: 12]

[Total No. of Printed Pages: 3]

UNIVERSITY OF PUNE

[4364]-281

B. E. (Polymer) Examination - 2013

INDUSTRIAL MANAGEMENT AND PROCESS ECONOMICS
(2003 Course)

[Time: 3 Hours]

[Max. Marks: 100]

Section 1

- Q.1 (A) Discuss at least one motivational theory and write in short about leadership traits [5]
(B) Explain the applications of ergonomics in the industry [6]
(C) What do you understand by "Present worth of money?" [6]
- OR
- Q.2 (A) The price of an article made by company is Rs 10 and marginal cost of production is Rs 5. Total fixed cost of the company is Rs 500 per annum Construct break even chart and show- [8]
1) Break even point
2) Margin of safety at Sales Rs 1000
3) Angle of incidence
- (B) Discuss various factors taken into consideration before a plant location is selected. [5]
(C) Write in short about pricing policies for new products [5]
- Q. 3 (A) What do you understand by debt-equity ratio? [6]
(B) Write in short about working capital [6]
(C) Explain the concept of fixed capital. [4]
- OR
- Q. 4 (A) What do you understand by Return on Investment? [6]
(B) Write in short various methods of raising capital or sources of funds. [10]
- Q. 5 (A) Discuss at least 8 different methods of calculating "Depreciation" Discuss by taking suitable examples [12]
(B) Write in short about labor and overhead costs [4]
- OR
- Q. 6 (A) Discuss in short various types of taxes and like sales tax, octroi, excise etc [8]
(B) Write in short about budget and budget control [8]

SECTION II

- Q. 7 (A) Explain steps involved in Vogel's Approximation Method [8]

- (B) Solve the following travelling salesman problem to minimize cost per cycle. [10]

	1	2	3	4
1	∞	10	25	25
2	1	∞	10	15
3	8	9	∞	20
4	14	10	24	∞
5	10	8	25	27
				∞

OR

- Q. 8 (A) [10]

Job Sequence1	A	B	C	D	E
Time – Hrs	2	3	5	2	1
Job Sequence 2	D	C	A	B	E
Time - Hrs	6	2	3	1	3

Use graphical method to minimize time required to process Find for each job the machine on which it must be processed first

- (B) Use two phase simplex method to maximize [8]
 $Z = 5x_1 + 3x_2$ subject to following constraints:
 $2x_1 + x_2 \leq 1$
 $x_1 + 4x_2 \geq 6$
 $x_1, x_2 \geq 0$

- Q. 9 (A) Solve the following game by graphical method [10]

		Player B						
		1	2	3	4	5		
Player A		x_1	1	-5	5	0	-1	8
$x_2 = 1 - x_1$		2	8	-4	-1	6	-5	

- (B) Write in short about decision model under uncertainty [6]
 OR

- Q. 10 (A) Define and explain following terms : [6]

- 1) Earliest start time
- 2) Latest start time
- 3) Latest finish
- 4) Earliest finish

- (B) Activity times for the network are given below. Find free float, independent float and total float [6]

Activity	Time	Activity	Time	Activity	Time
1-2	2	1-4	2	3-6	5
1-3	3	2-6	1	4-6	5

- Q. 11 (A) Write in short about inventory management with price breaks [8]
(B) Explain in short ABC analysis FNSD analysis [8]
- OR
- Q. 12 (A) Obtain expression for optimum order quantity and optimum time interval in case of inventory model where- [10]
1) Demand rate is uniform
2) Production rate is finite
3) Shortages are allowed.
- (B) Write expressions for optimum order quantity in following cases: [6]
1) Demand rate finite and Production rate finite
2) Instantaneous demand, Set up cost zero, Stock levels discrete and lead time zero. [6]

[Total No. of Questions: 12]

[Total No. of Printed Pages: 2]

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B. E. (Polymer) Examination - 2013
SPECIALTY POLYMERS (2003 Course)

[Time: 3 Hours]

[Max. Marks: 100]

Instructions:

- 1 Answers to Sections-I and Sections-II should be written in separate answer-books.
 - 2 Solve 3 questions from Section I and 3 questions from Section II
 - 3 Neat diagrams must be drawn wherever necessary.
 - 4 Figures to the right indicate full marks.
 - 5 Assume suitable data, if necessary.
 - 6 Use of electronic pocket calculator is allowed.
-

SECTION -I

- Q.1 A Explain the terms Thermotropic and Lyotropic liquid crystalline polymers. 8
 B What are Isotropic and Anisotropic and Isotropic phases? Explain their role forming liquid crystalline phase. 6
 C Aromatic polyamides belong to liquid crystalline polymers. Justify. 4
 OR
- Q.2 A Explain in detail Processing of Poly (p-phenylene terephthalamide) i.e. Kevlar® fiber or film. 7
 B Write a short note on “Blending of Liquid Crystalline Polymers” 7
 C Enlist characteristics of liquid crystalline phase. 4
- Q. 3 A What are conducting polymers? Give 5 examples of conducting polymers. Draw their chemical structures. 8
 B Write short note on Band Theory applied to conducting polymers. 8
 OR
- Q. 4 A Write short note on Doping Process used in conducting polymers. 8
 B Explain in detail use of conducting polymers in Rechargeable Batteries. 8
- Q. 5 A Explain in detail structural features of heat resistance polymers. 8
 B Discuss about various additives used to improve heat resistance of polymers. 8
 OR
- Q. 6 A Write short note on “Ladder Polymers as Heat Resistant Polymers.” 8
 B How heat resistance of given polymer is assessed? Comment on the various parameters those affect the results of tests carried out for assessing heat resistance. 8

SECTION II

- | | | |
|-------|--|---|
| Q. 7 | A Enlist various modes of mass transport through membrane. Explain any one in detail. | 7 |
| | B Write short note on Photolithography. | 7 |
| | C Explain the terms positive and negative photoresists. | 4 |
| | OR | |
| Q. 8 | A Write short note on Photosensitive polymers. | 7 |
| | B Explain two methods of casting membranes. | 7 |
| | C Enlist applications of polymeric membrane | 4 |
| Q. 9 | A Write short note on biopolymers used in tissue engineering. | 8 |
| | B What are Biocatalysts? Give their advantages and disadvantages | 8 |
| | OR | |
| Q. 10 | A Write short note on biomaterials in dental applications. | 8 |
| | B Explain in detail biopolymers in orthopedic applications and rehabilitation aids. | 8 |
| Q. 11 | A Discuss in detail use of polymers in agricultural applications. | 8 |
| | B Explain in detail use of polymers in fiber optics. | 8 |
| | OR | |
| Q. 12 | A Write short note on use of polymers in Concrete. | 8 |
| | B Explain in detail various parameters of polymer films used for green houses and mulches. | 8 |

[Total No. of Questions: 12]

[Total No. of Printed Pages: 2]

UNIVERSITY OF PUNE
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B.E. (Polymer) Examination - 2013
FIBER TECHNOLOGY (ELECTIVE- II)
BACKLOG (2003 Course)

[Time: 3 Hours]

[Max. Marks: 100]

Instructions:

- 1 *Solve 3 questions from Section I and 3 questions from Section II.*
- 2 *Answers to the two sections should be written in separate answer-books.*
- 3 *Neat diagrams must be drawn wherever necessary.*
- 4 *Figures to the right indicate full marks.*
- 5 *Assume suitable data, if necessary.*
- 6 *Use of electronics pocket calculator is allowed*

SECTION -I

- Q.1 A Explain in detail Melt Spinning technique of fiber manufacture. [9]
 B Write short note on Manufacture of Viscose Rayon fiber. [9]
 OR
- Q.2 A Explain in detail various critical parameters alongwith their variation along spin-line for melt spinning process. [9]
 B With suitable example explain Dry-Jet wet spinning technique. [9]
- Q.3 A Explain in detail classification of fibers alongwith suitable examples. [8]
 B Write short note no Synthesis of Nylon66 used in fiber application. [8]
 OR
- Q. 4 A Explain in detail synthesis of Polyethylene terephthalate (PET) alongwith side reaction. [8]
 B Write short note on Silk as Natural Fiber. [8]
- Q. 5 A What are the various ingredients used in Spin finish formulation? [6]
 Explain any one in detail.
 B What is Texturing of fiber? Explain Air Jet and Stuffer box techniques of texturing. [10]
 OR
- Q. 6 A Write a short note on False Twist Process. [8]
 B Explain in detail any one technique of applying Spin Finish. [8]

SECTION II

- | | | | |
|-----------|---|--|------|
| Q. 7 | A | What are the structural changes taking place during fiber spinning. | [9] |
| | B | What are staple fibers? Explain any one process used for staple fiber production | [9] |
| OR | | | |
| Q. 8 | A | Explain in detail Heat Setting of Fibers. | [8] |
| | B | Explain the significance of crimping process in fiber field. | [5] |
| | C | Explain 3-phase model of fiber structure. | [5] |
| Q. 9 | A | Briefly comment on various methods used for mass colouration of polyester fiber. | [12] |
| | B | Explain Bi-component acrylic fiber concept. | [4] |
| OR | | | |
| Q. 10 | A | Write a short note on Thermosol and High Temperature dyeing techniques. | [8] |
| | B | Explain method of preparing hydrophilic acrylic fibers. | [8] |
| Q. 11 | A | Comment on necessity of modification of fibers. With suitable example explain any one method used to modify fiber. | [10] |
| | B | Write short note on Nano-fibers and their applications. | [6] |
| OR | | | |
| Q. 12 | A | What are Non-woven fibers? Give their applications. Explain one method to manufacture non-woven fibers. | [10] |
| | B | Write short note on Optical Fibers. | [6] |

[Total No. of Questions: 12]

[Total No. of Printed Pages: 3]

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B. E. (Polymer Engineering) Examination - 2013
MECHANICS OF COMPOSITES
(2003 Course)

[Time: 3 Hours]

[Max. Marks: 100]

Instructions:

- 1 Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 from Section I and Q7 or Q8, Q9 or Q10, Q11 or Q12 from Section II
- 2 Answers to the two sections should be written in separate answer-books.
- 3 Black figures to the right indicate full marks.
- 6 Use of scientific calculator, log paper, log-log paper is allowed.
- 7 Assume suitable data, if necessary.

SECTION -I

- | | | | |
|------|---|---|----|
| Q.1 | A | Discuss resin transfer molding. Give a schematic sketch. Discuss process variable. | 8 |
| | B | Give Darcy's equation for resin flow and explain gel time for determining curing characteristic. | 8 |
| | | OR | |
| Q.2 | A | Write in details about hand layup and spray lay up in details. | 8 |
| | B | Discuss pultrusion process in details. | 8 |
| Q. 3 | A | Write a note on Maximum Stress Theory and Maximum Strain Theory. | 8 |
| | B | Prove that reduced transformed stiffness matrix for an orthotropic lamina can be given by $[\bar{Q}] = [T]^{-1} [Q]^{-1} [T]^T$ where $[T]$ is transformation matrix and $[Q]$ = reduced stiffness matrix | 10 |
| | | OR | |
| Q. 4 | A | Write a note on Tsai- Wu tensor theory. | 8 |
| | B | Prove that for an orthotropic lamina, condition for restriction on poisson's ratios are given by | 10 |

$$\sqrt{\nu_{21}}^2 + \sqrt{\nu_{32}}^2 + \sqrt{\nu_{13}}^2 < \frac{1 - \sqrt{\nu_{21}\left(\frac{E_{11}}{E_{22}}\right)} - \sqrt{\nu_{32}\left(\frac{E_{22}}{E_{33}}\right)} - \sqrt{\nu_{13}\left(\frac{E_{33}}{E_{11}}\right)}}{2} < \frac{1}{2}$$

- | | | | |
|------|---|---|---|
| Q. 5 | A | Prove the rule of mixtures for major Poisson's ratio ν_{12} in terms of | 8 |
|------|---|---|---|

- Poisson's ratio of fibre and Poisson's ratio of matrix using mechanics of materials approach.
- B For a sheet molding compound, data for fibre and matrix is as follows for fibre:
- $E_f = 70 \text{ GPa}$, $\rho_f = 2.5 \text{ kg/mm}^3$, $l_f = \text{fibre length} = 25\text{mm}$, $d_f = \text{fibre diameter} = 3\text{mm}$, for matrix $E_m = 4 \text{ GPa}$, $\rho_m = 1\text{kg/mm}^3$
- Calculate tensile modulus, shear modulus and Poisson's ratio.
- OR
- Q. 6 A Reduce the Halpin-Tsai equations of lower and upper bound of composite materials. 8
- B Give lower and upper bound on apparent Young's modulus using elasticity approach to stiffness. 8
- SECTION II**
- Q. 7 A Discuss low energy impact tests used to study composites. 8
- B List all the tests used to study compressive properties of composites. describe any one in details. 8
- OR
- Q. 8 A Describe the four point bending test used for studying flexural properties of composites. 8
- B Write a note on Weibull distribution used to analyse composite test results. 8
- Q. 9 A Give stepwise design procedure for design of a torsional member. 8
- B Obtain an expression for beam deflection for a simply supported beam of length L and uniformly distributed load F. 8
- OR
- Q. 10 A Obtain an expression for bending stiffness of a sandwich beam made of central core material and outer skin on either side. 8
- B Explain the benefit of using sandwich structure in place of solid sections in structural applications of beams. 8
- Q. 11 A Write force and moment resultants for antisymmetric cross ply laminates and single layered isotropic laminates. 8
- B For a $[-60/+60/-60/+60]$ anti-symmetric angle ply laminate with each layer 1mm thick, calculate $[A]$, $[B]$ and $[D]$ matrix. The reduced transformed stiffness matrix for individual layers are given below:
- $$[\bar{Q}]_6 = \begin{pmatrix} 20 & 25 & -15 \\ 25 & 85 & -41 \\ -15 & -41 & 28 \end{pmatrix} \text{ GPa}$$

$$[\bar{Q}]_{-6} = \begin{pmatrix} 20 & 25 & +15 \\ 25 & 85 & +41 \\ +15 & +41 & 28 \end{pmatrix} \text{ GPa}$$

OR

- Q. 12 A A $[0/60]_s$ glass epoxy laminahas following engineering properties. 12
 Find out [A],[B] and [D] matrix if all the plies are 0.12mm in thickness.
 $E_{11} = 145 \text{ GPa}$ $E_{22} = 12 \text{ GPa}$, $G_{12} = 8 \text{ GPa}$, $\nu_{12} = 0.3$.
 B Discuss quasi isotropic laminates. 6