

Department of Leather Engineering
Khulna University of Engineering & Technology
 B. Sc. Engineering 4th Year 2nd Term Examination-2019
Materials Science for Footwear Products
LE 4025

Time: 3 Hours.

Full Marks: 210

- N.B. i) Answer any THREE questions from each section in separate scripts.
 ii) Figures in the right margin indicate full marks.
 iii) Assume reasonable data if any missing.

SECTION-A

- | | |
|---|----|
| 1(a) State the application of aniline leather and patent leather as shoe upper. | 08 |
| 1(b) Discuss briefly about different types of thread numbering systems including suitable examples. | 12 |
| 1(c) Write short notes on the following shoe upper materials: i. Kevlar TM and ii. Sandwich mesh | 10 |
| 1(d) "Computer controlled 4D knitting is changing the way athletic shoes are made"—Justify it. | 05 |
| | |
| 2(a) Why is poromeric called man made leather? Describe briefly about the different layers of poromeric upper. | 11 |
| 2(b) Why flex crack resistance and slip resistance properties are considered as the most important properties for shoe soling materials? | 08 |
| 2(c) Define the flex crack resistance. "In cold country, flex crack resistance needs to cope up with the temperature", write down the factors you will follow to improve its characteristics. | 07 |
| 2(d) Define reaction injection moulding (RIM) process. Show the schematic diagram for the manufacturing of PU sole by RIM process. | 09 |
| | |
| 3(a) What is meant by phylon sole? How is it produced? | 07 |
| 3(b) Define vulcanization. Which properties of soling materials are modified by vulcanization process? | 07 |
| 3(c) Why is blowing agent used in sole manufacturing process? How does it work and what types of materials are used as blowing agents? | 07 |
| 3(d) Why does TPR sole not require vulcanization? Discuss briefly about the polymeric structure of TPR sole. | 08 |
| 3(e) Distinguish between one part and two part PU adhesives. | 06 |
| | |
| 4(a) Define adhesion. Mention the factors for various links of upper and sole adhesion. | 10 |
| 4(b) Define the following adhesive terminologies: i) Drying time, ii) Spotting tack and iii) Peel strength. | 09 |
| 4(c) State the functions of the ingredients of hot melt adhesive including their functions. | 10 |
| 4(d) Write down the environmental concern regarding the use of adhesive and solvent in footwear and leather products industries. | 06 |

SECTION-B

5(a)	Compare between thermoplastic granular mixture and cold setting granular mixture as bottom filler.	06
5(b)	Sketch different parts of heel. Write short note on built heel.	10
5(c)	State the manufacturing process of cork block and processed cork.	06
5(d)	Write the advantages of cellulose insole over leather and leather board insole.	06
5(e)	Define fiddle shank. Explain austempering process briefly.	07
6(a)	Define toe-puff. Write short note on celluloid impregnated fabric and paint on puff.	10
6(b)	Sketch different parts of an eyelet and write down the purposes of an eyelet.	07
6(c)	How does a flute increase the strength of a steel shank?	06
6(d)	Write short notes on: i. Surface eyeleting ii. Blind eyeleting iii. Celluloid dipping and iv. Starred eyelet setting	12
7(a)	Categorize different eyelets based on application. Express the shoe lace length factors with necessary figures.	09
7(b)	Write short notes on: i. Criss-cross lacing method and ii. Shoe-shop lacing method. Provide figure(s) where necessary.	14
7(c)	Define aglet. Explain wrinkle chasing operation	04
7(d)	Explain different types of reinforcements that are used in different seams.	08
8(a)	Write short notes on strap attachment with reinforcement with necessary figure(s).	07
8(b)	State the advantages and disadvantages of wax-in-water emulsion over solvent type shoe polish.	09
8(c)	Briefly explain the basic types of buckle attachment.	12
8(d)	Enumerate the mechanism of “touch and close” fasteners with necessary figure(s).	07

Department of Leather Engineering
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 B. Sc. Engineering 4th Year 2nd Term Examination-2019
Testing of Leather and Allied Materials
LE 4213

Time: 3 Hours.

Full Marks: 210

- N.B. i) Answer any THREE questions from each section in separate scripts.
 ii) Figures in the right margin indicate full marks.
 iii) Assume reasonable data if any missing.

SECTION-A

- | | | |
|------|--|----|
| 1(a) | Define thumb test with its pros and cons. How does a purchaser assess the quality of leather physically? | 07 |
| 1(b) | Briefly discuss the standard test procedure and improving factors of following thumb tests: i. Looseness ii. Run property and iii. Grain crackiness. | 12 |
| 1(c) | Why do you need sampling? Suppose, you are given 475 pcs of leather in a lot. How many pcs and which pcs should be taken out for visual observation and laboratory test? | 10 |
| 1(d) | Define conditioning. Why conditioning of test specimen is essential before conducting a test? | 06 |
| 2(a) | Describe the sampling position of side leather and unknown piece with every detail. | 12 |
| 2(b) | Establish the relationship between tensile strength and percentage of elongation. | 04 |
| 2(c) | Discuss the influencing factors of tensile strength of leather. | 10 |
| 2(d) | State the significance and standard procedure of double hole stitch tear strength measurement of leather. | 09 |
| 3(a) | What does tearing strength measure? Discuss the standard test method of Baumann tear strength test. | 09 |
| 3(b) | Outline the factors responsible for high and low tearing strength of leather. | 05 |
| 3(c) | How a leather specimen tears and shows high elongation? | 10 |
| 3(d) | Show the relationship between different strength properties of leather. | 05 |
| 3(e) | Lastometer test is known as overall strength test of leather- justify it. | 06 |
| 4(a) | Define leather finish film. Discuss the factors influencing leather - finish film bondage. | 08 |
| 4(b) | Write the significance, testing method and improving parameters of following test of finished leather: i) Light fastness ii) Cold crack resistance and iii) Bleeding | 18 |
| 4(c) | State the principle of wet and dry rub fastness test by circular rub fastness tester. | 09 |

SECTION-B

5(a)	Define fogging. Mention the salient effects of fogging of automotive leather.	05
5(b)	Why is fogging value very vital for automotive leather? Narrate the gravimetric test method to determine the fogging value.	12
5(c)	Briefly explain the factors affecting the fogging value of automotive leather.	10
5(d)	Write down the principle of water penetration and water proofness test.	08
6(a)	What is scuffing? Why is high scuff resistance needed for kiddy shoe upper leather?	06
6(b)	Illustrate the scope, principle and standard operation procedure of softness test of garments leather.	12
6(c)	Cite the standard value of WVP and WVC for shoe upper leather and lining leather.	04
6(d)	How do you enhance air and WVP of shoe upper and garments leather?	08
6(e)	The rate of transfer of water vapour through a pig skin specimen is 125 mg. per hour, when one side of it is at zero and the other at 100 % R.H. and under similar conditions the rate for a chrome side specimen is 67.5 mg. per hour. When both leather are clamped together, what will be the rate of transfer?	05
7(a)	Why should the quality of different accessories be checked before product manufacturing?	06
7(b)	Depict the principle and procedure of the following test: i) Abrasion between shoe lace and eyelets ii) strength of fastened buckles	14
7(c)	Give a chart account on colour rub fastness test and shrinkage temperature of upper leather.	07
7(d)	Explain the significance of heavy retanning of the flexing endurance of shoe upper leather.	08
8(a)	Describe the scope, principle, procedure and observation stages of resistance to crack initiation and growth-belt flex method.	13
8(b)	Discuss the significance, test method and observation stages of Bennewart flexing test of soling materials.	12
8(c)	Briefly discuss two tests for insole materials including flexing index test.	10

Department of Leather Engineering
Khulna University of Engineering & Technology
 B. Sc. Engineering 4th Year 2nd Term Examination-2019
Dyeing & Finishing II
LE 4207

Time: 3 Hours.

Full Marks: 210

- N.B. i) Answer any THREE questions from each section in separate scripts.
 ii) Figures in the right margin indicate full marks.
 iii) Assume reasonable data if any missing.

SECTION-A

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|------|--|----|
| 1(a) | What is meant by non-ideal behavior of dye solution? With the rise of temperature, the speed of dyeing also increase-Explain with example. | 10 |
| 1(b) | Describe which forces are responsible for the attraction between dyes and fibers? | 09 |
| 1(c) | Two media between which diffusion takes place is separated by a porous glass plate into two compartments. The volume of the inner compartment and outer compartment respectively 5 cm ³ and 8 cm ³ . The dye concentration in the two compartments is measured spectrophotometrically after 15 hr. the concentration of dye in the inner compartment is 256 ppm and in the outer compartment is 343 ppm. Find out the diameter of the diffusing particles. Where, B is 3.456 and temperature 75°C. | 12 |
| 1(d) | Differentiate between dye solution and ordinary solution. | 04 |
| 2(a) | Define dye aggregation. Why do most dyes trend to aggregate in solution? | 07 |
| 2(b) | “Diffusion coefficient depends on concentration” prove with the necessary figure. | 12 |
| 2(c) | Suppose diffusion of dye particles occurs in a steady-state where 349 ppm and 248 ppm are the concentrations of dye at the surface of the thin layer at 3h. Surface area is 34 cm ² and the diffusion coefficient is 2.0×10 ⁻⁷ cm ² /sec. Find out the activation energy of dye particles. | 10 |
| 2(d) | Write down the importance of diffusion in leather dyeing. | 06 |
| 3(a) | Show that free energy depends on temperature and pressure. | 12 |
| 3(b) | What is dyeing equilibrium? What kind of problem may arise if dyeing takes one or more weeks to reach a state of equilibrium? | 10 |
| 3(c) | Derive the final equation of the affinity of dyes for fibers. | 10 |
| 3(d) | Write a short note on the activity of dyes. | 03 |
| 4(a) | Discuss Freundlich isotherm with a necessary figure. List out the limitations of Langmuir isotherm. | 10 |
| 4(b) | Tannery wastewater contains 2920 mg/L chromium. After treatment with 2 g activated carbon, it contains 3.46 mg/L chromium. The equilibrium concentration of the wastewater is 171.34 ppm. Find out the Langmuir constant of the wastewater. | 12 |
| 4(c) | Describe the factors affecting adsorption. | 10 |
| 4(d) | Define the Fick's law in the extent of a diffusion process. | 03 |

SECTION-B

5(a)	Briefly explain the association of rheology with leather coating.	07
5(b)	Define the following terms: i. Rheology ii. Thixotropic and iii. Shear rate.	09
5(c)	Explain the environmental concerns and solution regarding VOC emission during leather dyeing and finishing.	12
5(d)	Explain the physics of film formation by William's-Landel-Ferry's equation.	07
6(a)	Provide the necessity of performance property evaluation of leather coating.	07
6(b)	Scope the scope and working procedure for the following: i. Resistance to plasticizers ii. Moisture fastness of finish film iii. Bleeding and iv. Resistance to washing and cleaning agents.	20
6(c)	Define colorimetry-show additive and subtractive color mixing through Venn diagram.	08
7(a)	Explain the importance of colorimetry in leather dyeing and finishing.	05
7(b)	State the principles and chromaticity diagram of the CIE system. Show the region for 520 nm and 700 nm and explain according to the CIE system.	12
7(c)	State the 5BG6/7 according to Munshell color system.	03
7(d)	Define metamerism. Write some solutions to reduce the effects of metamerism during leather dyeing.	05
7(e)	Define the color temperature. Explain Kubelka-Munk analysis for absorption and scattering.	10
8(a)	Differentiate between rod and cone cells in case of color perception.	04
8(b)	Write down the trichromatic theory with its limitations.	08
8(c)	State different types of illumination for color perception.	10
8(d)	Explain the working principle of the opponent theory of color vision.	07
8(e)	Define color. Briefly state about the perception of color.	06

Department of Leather Engineering
Khulna University of Engineering & Technology
B. Sc. Engineering 4th Year 2nd Term Examination-2019
Industrial Management and Entrepreneurship
IPE 4219

Time: 3 Hours.

Full Marks: 210

- N.B. i) Answer any THREE questions from each section in separate scripts.
 ii) Figures in the right margin indicate full marks.
 iii) Assume reasonable data if any missing.

SECTION-A

- | | | |
|------|--|----|
| 1(a) | Define "Industrial Management". Why management is considered as a dynamic process? Explain with suitable examples. | 13 |
| 1(b) | Briefly describe management function with suitable sketch. | 12 |
| 1(c) | Define span of management. Describe the factors that reduce the number of subordinates a manager can supervise effectively. | 10 |
| 2(a) | What is meant by motivation? Briefly describe expectancy theory of motivation. | 15 |
| 2(b) | Differentiate between project and matrix organization. | 10 |
| 2(c) | Differentiate between centralization and decentralization of administration. | 10 |
| 3(a) | Define the term "Group dynamics". Write down the assumptions of theory Y. | 12 |
| 3(b) | Why delegation of authority is necessary? Discuss the obstacles of effective delegation. | 13 |
| 3(c) | What is communication? Mention the barriers to successful communication. | 10 |
| 4(a) | Differentiate job evaluation and merit rating. Discuss briefly the steps of point method with example. | 15 |
| 4(b) | A job is rated in terms of wages of Tk. 900 per day. The standard time set for the job is 15 days, 8 hrs./day. Four workers have taken 100, 115, 120 and 150 hrs. respectively for the completion of the job. A bonus of 70% on the time taken will be given only to those who have completed the job in the standard time. Calculate the earnings of individuals by Rowan plan. | 20 |

SECTION-B

- | | | |
|------|--|----|
| 5(a) | Define the term "Entrepreneurship". Find out the major reasons of entrepreneurial failure and explain them. | 15 |
| 5(b) | Explain the risk factors involved in creating high technology entrepreneurs. | 10 |
| 5(c) | Explain the reasons behind the entrepreneurship failure in the context of Bangladesh. | 10 |
| 6(a) | Define strategy. Discuss various levels of strategy. | 10 |
| 6(b) | Define conflict. Explain major six sources of generating conflict in any organization with necessary examples. | 15 |
| 6(c) | Define technology transfer. Describe different modes of technology transfer. | 10 |
| 7(a) | What is sole proprietorship business? What are the risks associated with starting a new business? | 10 |
| 7(b) | Briefly explain the seven secrets of business success. | 10 |
| 7(c) | What is meant by separation process? Discuss various types of employee separations with example. | 15 |
| 8(a) | What is meant by Management Information System (MIS)? How does MIS help to control production efficiency through production information? | 10 |
| 8(b) | Write down the features of MIS. Describe different components of Marketing Information System. | 10 |
| 8(c) | Define data and information. How do these two's differ from one another? Explain with suitable examples. | 08 |
| 8(d) | Write down the advantages and disadvantages of entering a family business. | 07 |

Department of Leather Engineering
Khulna University of Engineering & Technology
 B. Sc. Engineering 4th Year 2nd Term Examination-2019
Production & Quality Control
LE 4217

Time: 3 Hours.

Full Marks: 210

- N.B. i) Answer any THREE questions from each section in separate scripts.
 ii) Figures in the right margin indicate full marks.
 iii) Assume reasonable data if any missing.

SECTION-A

- 1(a) Draw the schematic view of production system. Write short notes on production elements. 10
 1(b) Suppose you are an entrepreneur going to establish Sundarban footwear ltd. near Khulna with an initial production target of 3000 pairs of shoes with five varieties per month; which production system and plant layout you should follow and why? 10
 1(c) State the law of return to scale. Discuss the stages of production based on law of return to scale with suitable example. 15
 2(a) What is single factor productivity? State the key steps for improving productivity. 10
 2(b) Define aggregate planning of production. What are the points available for the managers to meet the fluctuating future demand? 11
 2(c) The demand forecast of a footwear company over the three months and the relevant costs involved in production are given below- 14

Table-2C(1)

Month	March	April	May	June
Demand (pair)	1248	840	1150	1360
Working days	24	20	21	21

Table-2C(2)

Inventory holding cost	\$ 1.5/U/M	Straight time cost (8hr)	\$ 4/hr
Back orders	\$ 5/U/M	Outsourcing cost	\$ 20/U
Hiring and training cost	\$ 200/W	Lay off cost	\$ 250/W

Ending inventory in February was 420 pairs of shoes and 35 workers are currently working in the plant with a production rate of 0.20U/hr. Now make an aggregate plan of the company according to chase strategy and find out the total cost of the company for this time horizon.

- 3(a) Write down the steps of demand forecasting. 05
 3(b) State the forecasting models. 06
 3(c) What is coefficient of correlation? Describe the exponential smoothing method of forecasting with an example. 11
 3(d) Step shoe is private organization engaged in the manufacture of shoe last. The management of the firm think that sales of the last logically be related to the amount of spent on footwear production. If a relationship does exist, published government and footwear industry forecasts of anticipated footwear production levels can be used as an additional sales predictor. First a check is made to confirm that the footwear level forecasts are relatively accurate. Next the national figures are broken down to confirm to the firms marketing areas. The records of monthly footwear production volume and last sales for corresponding months are collected and tabulated in the following table. Where footwear volume is in Tk. 100 millions units and lasts sales are in Tk. 10000 units. 13

Month	Lasts sales $\times 10^4$	Footwear manufacturing volume $\times 10^8$
1	07.5	02.0
2	10.0	02.5
3	09.0	02.0
4	10.5	03.0
5	11.5	03.5

- Find out: (i) Is it worthy to consider the correlation between sales of lasts and footwear volume?
 (ii) If projected footwear volume for the next month is Tk. 300,000,000. What would be sales of volumes of the lasts in Tk.?

- 4(a) Define PPC. State the levels and categories of PPC. 11
- 4(b) What is qualitative forecasting? Write down the features of Delphi method. 08
- 4(c) What is material handling? State the categories and classification of material handling equipment. 10
- 4(d) Write down the job responsibilities of a planning officer. 06

SECTION-B

- 5(a) Clarify the terms "quantity, quality control and quality assurance". Distinguish between quality control and quality assurance. 10
- 5(b) Discuss the quality management principles with example. 10
- 5(c) Describe the key elements of TQM for the implementation in footwear industry. 10
- 5(d) Write about Zero defects. Mention the principles of Zero defects. 05
- 6(a) What is meant by "quality improvement cycle"? Is it necessary for organization, why? 06
- 6(b) Mention the core activities of ISO 9001:2004. 04
- 6(c) Contrast between Six Sigma and TQM. 05
- 6(d) A quality control team inspect 100 deliveries of wallet and observe that 15 delivery is not on time, number of order wallet is not according to the order is 3 and number of wallet with hole is 4. Now estimate the DPMO based on the provided data. 10
- 6(e) Describe DMAIC concept of six sigma 10
- 7(a) What is ISO 14000 series? State the elements of ISO 14001. 08
- 7(b) What is break-even point? How does it determine the profit margin? 08
- 7(c) Define EIA. State in brief the various activities and goals of EIA. 12
- 7(d) Mention the hazards and safety measures performing in a sewing department of a leather products industry. 07
- 8(a) Define project and program. 05
- 8(b) What is meant by CPM and PERT? Describe three points estimation techniques. 10
- 8(c) The fabrication process of a jacket are scheduled in the following table: 20

Activity	O _r	M _T	P _r	Predecessor
A	02	08	14	
B	04	04	04	
C	05	10	16	A
D	06	08	10	A
E	08	12	16	C,B
F	01	01	12	C,B
G	06	12	18	D,E

Find: (i) The network (ii) All expected times (iii) Slacks and Variances (iv) The critical path.