

**KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY**

*Department of Textile Engineering*

B. Sc. Engineering 4<sup>th</sup> Year 2<sup>nd</sup> Term Examination, 2016

**IPE 4223**

(Operations Management)

Time: 3 Hours

Total Marks: 210

- N.B.:** i) Answer any THREE questions from each section in separate scripts.  
ii) Figures in the right margin indicate full marks.

**SECTION-A**

- 1(a) Define operation. Give some of the reasons why the study of operations management is important for future managers. 08
- 1(b) What is dummy activity? Why dummy activity is used in network diagram? 07
- 1(c) Three recent college graduates have formed a partnership and have opened an advertising firm. Their first project consists of activities listed in the following table. 20

Activity	Immediate predecessor	Time in days		
		Optimistic	Most likely	Pessimistic
A	–	5	6	7
B	–	8	8	11
C	A	6	8	11
D	–	9	12	15
E	C	5	6	9
F	D	5	6	7
G	F	2	3	7
H	B	4	4	5
I	H	5	7	8
END	E,G,I			

- i) Draw the precedence diagram and calculate the critical path
- ii) What is probability that the project cannot be completed in 24 days or less?
- 2(a) Is the facilities-location problem for services different from that for manufacturing and in what respects? How does this apply to (i) a department store, (ii) a fire department and (iii) a law firm? 10

- 2(b) Alumco Ltd. Plans to set up a new aluminum products plant and has selected three sites with the following characteristics (for projected 75 percent capacity utilization equal to 300,000 tons/year). 20

Site	Annual fixed costs (millions)	Variable costs/ton
A	8.2	\$ 452
B	10	290
C	7.5	530

Relative subjective factors	Rating $R_{ij}$			Relative importance index, $W_j$
	A	B	C	
Housing	0.25	0.50	0.25	0.50
Community attitudes	0.25	0.25	0.50	0.25
Services	0.50	0.25	0.25	0.25

Determine the optimum location site if objective factors weigh twice as much as subjective factors.

- 2 (c) Under what conditions might foreign locations be preferred to domestic ones? 05
- 3(a) What is inventory? Why do you need to keep inventory? 08
- 3(b) Define EOQ with necessary figure. Deduce EOQ model with assumptions and find length of order cycle and numbers of order per year. 12
- 3(c) Annual demand for an item is 5400 units. Ordering cost is TK600 per order. Inventory carrying cost is 30% of the purchase price per unit per year. The price breaks are as shown below- 15

Quantity	$0 \leq Q_1 < 2400$	$2400 \leq Q_2 < 3000$	$3000 \leq Q_3$
Price	12	10	8

- (i) Find the optimal order size
- (ii) If the order cost is changed to TK 300 per order, find the optimal order size.

- 4(a) Define workstation and Make span. Determine the sequence of jobs, the average flow time, average tardiness and average number of jobs at the work centre for each of those rules – (i) EDD and (ii) S/O 15

Job	Job time (days)	Due date	Operations remaining
A	4.5	10	3
B	6.0	17	4
C	5.2	12	3
D	1.6	27	5
E	2.8	18	3
F	3.3	19	1

- 4(b) What is the bullwhip effect and why does it occur? How can it be removed? 05
- 4(c) A group of six jobs is to be processed through a two machine flow shop. The first operation involves cleaning and second involves painting. Determine a sequence that will minimize the total completion time for this group of jobs. Also calculate the idle time for each machine. Processing time are as follow- 15

Job	Processing time (hours)	
	Work centre 1	Work centre 2
A	5	5
B	4	3
C	8	9
D	2	7
E	6	8
F	12	15

### SECTION-B

- 5(a) Define "Work Sampling". Write the advantages and disadvantages of work sampling. 10
- 5(b) Briefly explain various types of allowances used to build standard time. 10
- 5(c) Define line balancing. Using the following information contained table shown. 15  
Management has designed on output rate of 240 units per eight-hour day. Determine:  
(i) Cycle time (ii) Minimum number of station and (iii) Percentage of idle time.

Task	Duration (minutes)	Precedes task
A	0.2	B
B	0.4	C
C	0.2	F
D	0.4	E
E	1.2	G
F	1.2	G
G	1.0	END

- 6(a) Draw an operation process chart for " Yarn Dyeing" 15
- 6(b) Briefly explain different method study symbols and their uses. 10
- 6(c) A work study was conducted in a machine shop. The data has been recorded. Total number of observations =2000; No activity=500; The ratio between manual to machine=3:1; Average performance rating=85%; Total number of pieces produced =120; Duration of the study=60hrs. Calculate the standard time/piece assuming 15% relaxation allowance. 10

7(a) Determine the optimum assignment of jobs to machines for the following data.

13

		Machine			
		A	B	C	D
Job	1	8	6	2	4
	2	6	7	11	10
	3	3	5	7	6
	4	5	10	12	9

7(b) Specify the range for the value of the game in the following case, assuming that the payoff is for player A:

	B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>	B <sub>4</sub>
A <sub>1</sub>	1	9	6	0
A <sub>2</sub>	2	3	8	4
A <sub>3</sub>	-5	-2	10	-3
A <sub>4</sub>	7	4	-2	-5

7(c) Define model with suitable example. How does mathematical model differ from physical model?

8(a) Maximize,  $Z=5x_1+4x_2$

12

Subject to,  $x_1-2x_2 \leq 1$

$x_1+2x_2 \geq 3$

$x_1, x_2 \geq 0$

Use graphical method.

8(b) Maximize,  $Z=5x_1+4x_2$

23

Subject to,  $6x_1+4x_2 \leq 24$

$x_1+2x_2 \leq 6$

$-x_1+x_2 \leq 1$

$x_1, x_2, x_3 \geq 0$

Use simplex method.

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**KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY**

*Department of Textile Engineering*

B. Sc. Engineering 4<sup>th</sup> Year 2<sup>nd</sup> Term Examination, 2016

**TE 4205**

(Wet Processing Engineering-IV)

Time: 3 Hours

Total Marks: 210

- N.B.:** i) Answer any THREE questions from each section in separate scripts.  
ii) Figures in the right margin indicate full marks.

**SECTION-A**

- 1(a) What is 2° standard observer? 05
- 1(b) Write down the functions of cone. If one of the cone is missed in human eye, which types of color vision are produced? Explain. 08
- 1(c) Prove the Lambert-Beer law  $I_0 = I \text{Exp}(lc\varepsilon)$  for the light absorption in a transparent material, where  $I$  is transmitted light energy,  $I_0$  is incident light energy,  $l$  is path length,  $c$  is concentration of colorant and  $\varepsilon$  is molar absorptivity. 15
- 1(d) Describe the parameters which have to be considered before measuring the sample on the reflectance spectrophotometer. 07
- 2(a) Define metamerism. What are the types of metamerism? 10
- 2(b) Analyze the L° C° h° theory. Why this theory is more compatible with computer color matching system than others? 10
- 2(c) How does dual beam reflectance spectrophotometer measure the shade of dyed fabric? Describe it with neat sketch. 15
- 3(a) Why OBA (Optical Brightening Agent) treated fabric is more brighter under UV light source? Explain with figure. 08
- 3(b) Write down the classification of optical brightening agent according to hue. 08
- 3(c) Write down the application process of optical brightening agent. 10
- 3(d) What are the reasons for using solvents in scouring process? 04
- 3(e) The following machines are used for woven fabric scouring: 05  
J-box, Steamer and Vapor-loc  
Why three different machines are necessary for same function? Explain your argument.
- 4(a) What are the basic difference between jigger and pad dyeing machine? 05
- 4(b) Write down the Pad-dry-pad-steam process for woven fabric dyeing. When Pad-(pad)-steam is more convenient than Pad-dry-pad-steam process? 10
- 4(c) Depict the Cold-pad-batch dyeing process. 07
- 4(d) Make a comparative statement among the cold-batch dyeing over jet dyeing and continuous dyeing process. 13

## SECTION-B

- 5(a) Why separate drying system is necessary in textile finishing? 05
- 5(b) What is convection method? Write down the hot air circulating system of convection method. 10
- 5(c) Write down the working principle of radio frequency dryer with proper sketch. 12
- 5(d) The following factors influence the drying temperature-explain. 08  
(i) Dyed fabric (ii) White fabric (iii) Fabric structure and (iv) Tone of the dyed shade
- 6(a) What is low wet pick -up finishing? Write down the advantages of low wet pick-up finishing. 08
- 6(b) What is CAV? If the CAV of textile fabric become less or more due to padder pressure ,what situations will be created and how to prevent those situations? Explain 08
- 6(c) "Pad application of chemicals to wet fabric is more preferable than dry fabric"-explain this statement. 09
- 6(d) Describe the working principle of dewatering machine with schematic diagram. 10
- 7(a) What is 'Flock'? 03
- 7(b) Describe the electrostatic and mechanical flocking method. Which method is more preferable? 15
- 7(c) Which conditions are required for transfer printing? 05
- 7(d) Write down the mechanism of dye transfer in sublimation transfer printing. 12
- 8(a) What is ink-jet printing? Why ink-jet printing is special than other printing styles? Explain. 05
- 8(b) Mention the difference between Continuous ink-jet and Drop on demand ink-jet printing method with figure. 08
- 8(c) Write down the piezoelectric printing method with figure. 12
- 8(d) Briefly describe the burn-out printing process for P/C fabric by jigger machine and padding mangle with standard recipe. 10

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**KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY**

*Department of Textile Engineering*

B. Sc. Engineering 4<sup>th</sup> Year 2<sup>nd</sup> Term Examination, 2016

**TE 4225**

(Machine Maintenance, Materials Handling and Safety)

Time: 3 Hours

Total Marks: 210

**N.B.:** i) Answer any THREE questions from each section in separate scripts.

ii) Figures in the right margin indicate full marks.

**SECTION-A**

- 1(a) Define maintenance. Why is it important to carry out maintenance activities for textile industries? 10
- 1(b) Discuss the elements of maintenance. 20
- 1(c) A knitting factory has 20 knitting machines that produce a variety of knit fabrics that generate a profit of \$100 per machine per day. The machines fail according to Poisson Distribution on an average of 2.2 machines down each day. What is the chance of having exactly 03 machines down on a given day? 05
- 2(a) What is Reliability Centered Maintenance (RCM)? How will you initiate a RCM for a textile industry? 13
- 2(b) Describe the test types for oil analysis. 12
- 2(c) Distinguish between predictive and preventive maintenance. 05
- 2(d) Write short note on Computerized Maintenance Management System (CMMS). 05
- 3(a) Describe different types of seals used in textile and other machinery. 10
- 3(b) The following failure rates have been observed for a certain type of parts in a textile equipment. 20

End of week	1	2	3	4	5	6	7
Probability of failure to date	0.07	0.18	0.30	0.48	0.69	0.89	1.00

The cost of replacing of failed part individually is BDT 08. If all the parts are replaced simultaneously it would cost BDT 2.50 per part. Any one of the following two operations can be followed—

- (i) Replace the parts individually when they fail (Individual replacement policy).
- (ii) Replace all the parts simultaneously at fixed intervals and replace the individuals parts as they fail in service during the fixed interval (Group replacement Policy).

Find out the optimal replacement policy. If group replacement policy is optimal, then at what intervals should all the parts be replaced?

- 3(c) Draw the bath tub curve used to analyze failure pattern of any equipment. 05

- 4(a) Discuss the types of lubrication? What are the methods of fresh lubrication? Discuss briefly. 13
- 4(b) Introduce the problems which occur during sewing and their remedies from ergonomical point of view. 13
- 4(c) Sketch and label the safe zone of reach of an over lock sewing machine. 04
- 4(d) Define: (i) Viscosity (ii) Pour point (iii) Viscosity Index (iv) Acidity and (v) Flash point of lubricants. 05

### SECTION-B

- 5(a) Explain the importance of material handling in industrial situation. 10
- 5(b) Discuss the factors to be considered while selecting material handling equipments. 15
- 5(c) What are the relationship between plant layout and material handling? 10
- 6(a) What is industrial hazard? Describe the categories of industrial hazards. 12
- 6(b) How will you improve safety system by automation in textile factory? 12
- 6(c) Which items should be in a first aid box of a sewing floor? 05
- 6(d) Mention the importance of safety education for industrial workers. 06
- 7(a) Describe the Provisions of safety mentioned in Bangladesh Factory Act. 12
- 7(b) State the general safety rules according to Bangladesh Factory Act. 15
- 7(c) What is safety culture? Mention and explain the characteristics of a safety culture. 08
- 8(a) Write short note on industrial toxicology. 08
- 8(b) What types of biological hazards commonly occur in textile industry? How it can be prevented? 15
- 8(c) Mention the equipment for handling the material for the following section of a textile mill: 06
- (i) Garments section (ii) Dyeing section (iii) Ring section (iv) Warehouse.
- 8(d) Present a scientific method of an industrial accident investigation. 06

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**KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY**

**Department of Textile Engineering**

B. Sc. Engineering 4<sup>th</sup> Year 2<sup>nd</sup> Term Examination, 2016

**TE 4207**

(Apparel Manufacturing Engineering-IV)

Time: 3 Hours

Total Marks: 210

- N.B.:** i) Answer any THREE questions from each section in separate scripts.  
ii) Figures in the right margin indicate full marks.

**SECTION-A**

- 1(a) Define production and productivity? Why productivity measurement is important? 06
- 1(b) A company produces 160kg of single jersey fabric by consuming 200kg of yarn for a particular period. For the next period, the output is doubled by consuming 420kg of yarn and for the third period, the output is increased to 420kg by consuming 450kg of yarn. Comment based on productivity. 08
- 1(c) Mention the objectives of work study. 12
- 1(d) What is production planning and control? Discuss in context of a garments production assembly. 09
- 2(a) Write the importance of line-balancing in garments factory. 08
- 2(b) Depict the types of production system for garments. 10
- 2(c) What is SMV and SAM? Mention the components of SMV? 10
- 2(d) Assuming that the total observed time for an operation of assembling a polo-shirt is 15.00min. 07
- (i) If the rating is 120%; find normal time.
- (ii) If an allowance of 10% is allowed for the operation, determine SMV.
- 3(a) List out the information that a commercial invoice normally includes. 06
- 3(b) Define CMT, EXW, FOB, LDP, DDP and CIF. 06
- 3(c) Why cut planning is so important for garment industries? Plan an optimum cut for the below order- 23

Sizes	30	32	34	36
Colors				
RED	21	42	42	21
GREEN	42	42	42	42
YELLOW	21	42	42	21

Consider- 1. Maximum ply height is 42

2. Number of garments per marker=4

If per fabric roll contains 50 meters of fabric and average fabric width is 56". Calculate the number of rolls required per color. [Assume other parameters]

- 4(a) Why order negotiation is important? 05
- 4(b) Discuss the responsibilities of a junior merchandiser. 08
- 4(c) Write about the fabrics and sewing threads used for manufacturing firefighter's turnout gear. 10

- 4(d) Show the steps of CM calculation from the following particulars- 12  
 Factory cost per day per line=40,000 BDT  
 Production per day per line (10hrs)= 1000 Pcs.  
 Fabric cost= \$ 26.71  
 Trim cost=\$ 17.45  
 [Assume other particulars].

### SECTION-B

- 5(a) State the price quotation system of a garment. 10  
 5(b) Write down the cost-components for price fixation. 08  
 5(c) Draw a costing sheet for a woven shirt. 12  
 5(d) What is performance rating? 05
- 6(a) Estimate the cost for the carton from the following data: 10  
 Carton length=92 cm  
 Carton width=80 cm  
 Height =40cm  
 Ply=7  
 Quantity=200 Pcs and price=\$ 0.60/m<sup>2</sup>
- 6(b) Find out the FOB, C& F and CIF price of the following item: 20  
 Item: Men's T-shirt, short sleeve, 100% cotton, GSM=140, single jersey, 1×1 rib neck, solid dyed (purple), light, medium and dark colors in different ratios.  
 \*(Measurement in cm)

Size	S	M	L	XL	XXL
Size ratio	3	2	3	2	2
1/2 chest	56	58	60	62	64
Body length	74	76	78	80	82
Sleeve length	22	23	24	25	26
Hem	04				
Neck Rid width	03				

Assume per dozen fabric price, CM and trimmings cost is \$2.6, \$5.5 and \$3.0 respectively.

- 6(c) What types of machines and stitches are used for making a polo-shirt? 05
- 7(a) Why industry pays more attention of marker making? 08  
 7(b) What factors are to be considered for increasing the marker efficiency? Discuss briefly. 12  
 7(c) How fabric losses outside of marker can be minimized? Discuss comprehensively. 15
- 8(a) What is fashion? Classify the fashion and describe it in details. 10  
 8(b) Define the following terms:- (i) Haute Couture (ii) Pret-a -Porter (iii) Open- to- buy 06  
 (iv) Hot number  
 8(c) Write down the characteristics of chain store operation. 05  
 8(d) Describe the theories of fashion leadership. 09  
 8(e) Make a list of the top 05 fashion cities of the world according to the last published 05  
 ranking.

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**KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY**

*Department of Textile Engineering*

B. Sc. Engineering 4<sup>th</sup> Year 2<sup>nd</sup> Term Examination, 2016

**TE 4203**

(Fabric Manufacturing Engineering-III)

Time: 3 Hours

Total Marks: 210

- N.B.:** i) Answer any THREE questions from each section in separate scripts.  
ii) Figures in the right margin indicate full marks.

**SECTION-A**

- 1(a) Write the advantages and disadvantages of shuttle loom. 10
- 1(b) Make a list of alternate means to achieve high weft insertion rate in weaving. 10
- 1(c) Briefly discuss about multi-cylinder drying machine with figure. 10
- 1(d) Mention the factors that influence the drying efficiency of a sizing machine. 05
- 2(a) How would you control uniform air jet pressure in air jet weaving? 10
- 2(b) Draw and Describe the following figures– 15
- (i) Positioning of main nozzles
- (ii) Positioning of sub nozzles
- (iii) Multiple nozzles with profiled reed
- 2(c) Make a comparative study between single and double rapier. 10
- 3(a) What is multiphase weaving system? 05
- 3(b) What are the features of weft wave multiphase? 08
- 3(c) Describe the reason of failure to use multiphase loom. 08
- 3(d) What is circular weaving machine? Describe the features and principle of M8300 14  
multiphase weaving machine.
- 4(a) What is BEP? How the BEP of a weaving mill will be reduced? 10
- 4(b) Classify the costing. 10
- 4(b) What are the main causes of production interruption? 07
- 4(c) What is efficiency? Describe the different types of efficiency. 08

**SECTION-B**

- 5(a) Differentiate between linear cam and non-linear cam. 10
- 5(b) Write short notes on: (i) Knitting elements (ii) Yarn tension and (iii) Fibrous dust system 15  
when manmade fiber is produced in weft knitted machine.
- 5(c) Write the advantages of automation which are used in knit industry. 10
- 6(a) What is multi-axial fabric? 05
- 6(b) State the features of multi-axial Raschel machine. 10
- 6(c) What are the end uses of multi-axial fabrics? 05

- 6(d) Describe the procedure when a new product (knit polo shirt) is received from a new buyer. Describe by the concept of R& D. 15
- 7(a) Describe the mechanism of multiple shuttle loom with neat sketch. 10
- 7(b) Write short notes on: (i) Webbing (ii) Tape and (iii) Label 15
- 7(c) Make a list of advantages of polyurethane foam sheet for laminated fabric. 10
- 8(a) Show that belt problem increases with the increase in thickness of belt but decreases with diameter of the pulley. 15
- 8(b) Write the mechanism of needle loom with neat sketch. 10
- 8(c) Compare between lappet weaving and swivel weaving. 05
- 8(d) Sketch the components of a braiding machine. 05

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**KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY**

*Department of Textile Engineering*

B. Sc. Engineering 4<sup>th</sup> Year 2<sup>nd</sup> Term Examination, 2016

**TE 4245**

(Nonwoven and Nanotechnology in Textiles)

Time: 3 Hours

Total Marks: 210

**N.B.:** i) Answer any THREE questions from each section in separate scripts.  
ii) Figures in the right margin indicate full marks.

**SECTION-A**

- 1(a) What is Non-woven fabric? 05
- 1(b) What are the differences among woven, knitted & non-woven fabric? 12
- 1(c) Describe the end uses of non-woven fabric. 09
- 1(d) What are the important economic advantages of non-woven fabrics? 09
- 2(a) What is Super Absorbent Fiber (SAF)? Mention its physical properties. 15
- 2(b) Describe the water absorption mechanism of SAF. 12
- 2(c) Write down the economic advantages of SAF. 08
- 3(a) Point out the steps for making non-woven fabric. 05
- 3(b) Describe the manufacturing process of direct laid web with neat sketch. 15
- 3(c) What is the function of embossing roller? Describe the film fibrillation process for making non-woven fabric. 08
- 3(d) What are the basic differences between dry-laid web & wet-laid web? 07
- 4(a) Briefly discuss the approaches for producing non-circular fibers. 10
- 4(b) Describe about different types of bi-component fiber. 15
- 4(c) Write a short note on plasma treatment which is applied on non-woven fabrics. 05
- 4(d) Write short notes on : (i) Maliwatt fabric & (ii) Malivlies fabric. 05

**SECTION-B**

- 5(a) Define the term nano-technology. Who is the father of nano-technology? Cited his comments about nano. 10
- 5(b) What is nano-fiber? Write down its properties and end-uses. 15
- 5(c) State the DLVO theory for two particles with figure. 10
- 6(a) Mention the nano-particles that used for nano-coatings. 07
- 6(b) Write the features of fumed silica. 05
- 6(c) Point out the Nano-materials and their properties used in nano-coatings. 10
- 6(d) State the advantages of TiO<sub>2</sub> as a photo-catalytic and also show its radical reactions. 13

- 7(a) Mention the methods for producing nano-fibers and make a comparative statement among the methods. 15
- 7(b) What is electro spinning? Write down the technical features of an electro spinning machine. 12
- 7(c) Write the properties of nano-particles used for nano-coating. 08
- 8(a) Mention some polymers (solution and melt form) used in electro spinning for nano-fibers production and also mention their end-uses. 15
- 8(b) Write short notes on: (i) Nano-care (ii) Nano-Pel (iii) Nano-Dry (iv) Nano-Tough (iv) Nano-Press. 10
- 8(c) Specify the application of nano-technology in textiles. 05
- 8(d) Why ZnO is widely used as nano-coatings? 05

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**KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY**

*Department of Textile Engineering*

B. Sc. Engineering 4<sup>th</sup> Year 2<sup>nd</sup> Term Examination, 2016

**TE 4237**

(Waste Management and Pollution Control in Textile)

Time: 3 Hours

Total Marks: 210

- N.B.:** i) Answer any THREE questions from each section in separate scripts.  
ii) Figures in the right margin indicate full marks.

**SECTION-A**

- 1(a) What is atmosphere? Mention the atmospheric structure with its attitude, temperature and contain molecules. 10
- 1(b) Describe the environmental segment. 15
- 1(c) What is sink and TLV? Explain with example. 10
- 2(a) State the categories sources of water pollution. 05
- 2(b) Describe the types of water pollution. 10
- 2(c) What are the major water pollutants? 05
- 2(d) What is eutrophication? What causes it and what are the dangers? 05
- 2(e) Which factors are responsible for acid rain? Write down the effects of acid rain on the environment. 10
- 3(a) What is air pollution? State the causes and effects of air pollution. 15
- 3(b) What is scrubber? Describe the different systems used in textile for air pollution control. 10
- 3(c) What steps are to be considered for solution of air pollution? 10
- 4(a) What is noise pollution? Write down the effects of noise at different decibel levels. 08
- 4(b) What is the difference between sound and noise? 05
- 4(c) Point out the noise with decibel level of the following sections: (i) Spinning section (ii) Weaving section & (iii) Wet processing section. Suggest how to control these problems? 17
- 4(d) Write the sources of noise. 05

**SECTION-B**

- 5(a) Write down the characteristics of wastewater to be discharged into the environment. 05
- 5(b) Write down the different filtration process for waste water treatment. 10
- 5(c) Describe the Electro-coagulation process for waste water treatment in effluent treatment plant. 12
- 5(d) Write short notes on: 08  
(i) BOD (ii) COD (iii) TDS & (iv) TSS
- 6(a) Define Aerobic and Anaerobic method. 08
- 6(b) What is flotation? What are the types of flotation system? 06

- 6(c) Why CPI (Corrugated Plate Interceptors) are more efficient than API (American Petroleum Institute) separators for oil separation? 06
- 6(d) Sketch the flow chart of bio-logical effluent treatment plant and state their functions of each section. 15
- 7(a) Write down the classification of general waste. 05
- 7(b) Mention the limit of eco-parameter for finished garments. 08
- 7(c) State the ways by which you can reduce the unused dye and chemical in dyeing process. 07
- 7(d) Briefly describe the Eco-friendly techniques to reduce the water pollution with figure. 15
- 8(a) What is meant by recycling? Write down the ways of recycling for synthetic fibers 13
- 8(b) How many ways textile waste can be handled? Describe the every process of this waste management. 08
- 8(c) How can you utilize the following textile wastes for environmental protection? 14
- (i) Leftover yarn in worsted spinning and weaving.
  - (ii) Catch selvedge in rapier weaving machine.
  - (iii) Heat and water in polyester dyeing.
  - (iv) Cut portions during garment manufacturing and discarded garments.

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