

**B.Sc Sugar Technology Part I,II and III Course structure**

**B.Sc Sugar Technology Part I: (Approved From 2015 onwards)**

**Sem:I ,No.Of Papers 9(Theory)**

Sr.No	Subject Titles	Theory	Term Work	Practical
1	English	50	-----	-----
2	Applied Chemistry Paper-I (Organic and Sugar chemistry)	50	-----	-----
3	Applied Chemistry Paper-II (Physical and Inorganic Chemistry)	50	-----	-----
4	Applied Physics Paper-I (Properties of matter and Thermodynamics)	50	-----	-----
5	Applied Physics Paper-II (Instrumentation)	50	-----	-----
6	Applied Mathematics Paper-I	50	-----	-----
7	Applied Statistics Paper-II	50	-----	-----
8	Sugarcane Agriculture Paper-I	50	-----	-----
9	Sugar manufacturing Paper-II (Juice Extraction and Clarification)	50	-----	-----
10	<b>Total</b>	<b>450</b>	-----	-----

**B.Sc Sugar Technology Part I: (Approved From 2015 onwards)**

**Sem:II ,No.Of Papers:9(Theory) Prcactical:4**

Sr.No	Subject Titles	Theory	Term Work	Practical	Total
1	English (Compulsory) (English For Communication)	50	-----	-----	50
2	Applied Chemistry Paper-III (Organic and Bio chemistry)	50	-----	50	150
3	Applied Chemistry Paper-IV (Physical and Analytical Chemistry)	50	-----		
4	Applied Physics Paper-III (Optics and Crystallography)	50	50		150
5	Applied Physics Paper-IV (Instrumentation: II)	50			
6	Applied Mathematics Paper-III	50	50	-----	150
7	Applied Statistics Paper-IV	50		-----	
8	Sugarcane Agriculture Paper-III	50	-----	50	150
9	Sugar manufacturing Paper-IV (Evaporation)	50	-----		
10	<b>Total</b>	<b>450</b>	<b>100</b>	<b>100</b>	<b>650</b>

**B.Sc Part I Sem:I :450 Theory and Sem: II 450 Theory + 200 Practical / Term work Total marks of exams :1100**

**B.Sc Sugar Technology Part II: (To be approved for 2016 onwards)**

**Sem:III ,No.Of Papers:6(Theory)**

<b>Sr.No</b>	<b>Existing Paper Titles</b>	<b>Proposed New Titles</b>
1	Physical and Inorganic Chemistry Paper:V	Equipment Design Paper:I (Clarification House)
2	Organic and Inorganic Chemistry Paper:VI	Capacity Calculations Paper:I (Clarification House)
3	Sugar Manufacturing Paper:V (Crystallisation)	Sugar Manufacturing Paper:III (Crystallisation)
4	Sugar Engineering Paper:VI (Milling I)	Sugar Engineering Paper:I (Mill House)
5	Chemical Engineering Paper:V	Chemical Engineering Paper:I (Heat and Momentum Transfer)
6	Chemical Control (Mill House)	Chemical Control Paper:I (Mill House)

**B.Sc SugarTtechnology Part II: (To be approved for 2016 onwards)**

**Sem:IV ,No.Of Papers:6(Theory)**

<b>Sr.No</b>	<b>Existing Paper Titles</b>	<b>Proposed New Titles</b>
1	Physical and Inorganic Chemistry Paper:VII	Equipment Design Paper:II (Evaporation and Crystallization House)
2	Organic and Inorganic Chemistry Paper:VIII	Capacity Calculations Paper:II (Evaporation and Crystallization House)
3	Sugar Manufacturing Paper:VII (Centrifugal)	Sugar Manufacturing Paper:I (Centrifugal)
4	Sugar Engineering Paper:VIII (Milling:II)	Sugar Engineering Paper:II (Boiler and Power House)
5	Chemical Engineering Paper:V	Chemical Engineering Paper:II (Unit Opertaion)
6	Chemical Control (Boiling House)	Chemical Control Paper:II (Boiling House)

**B.Sc Sugar Technology Part II: (To be approved for 2016 onwards)**

**Sem:III ,No.Of Papers:6(Theory)**

Sr.No	Paper Titles	Theory	Term Work	Practical	Total
1	Equipment Design Paper:I (Clarification House)	50	---	-----	50
2	Capacity Calculations Paper:I (Clarification House)	50	----	-----	50
3	Sugar Manufacturing Paper:III (Crystallisation)	50	----	-----	50
4	Sugar Engineering Paper:I (Mill House)	50	----	-----	50
5	Chemical Engineering Paper:I (Heat and Momentum Transfer)	50	----	-----	50
6	Chemical Control Paper:I (Mill House)	50	-----	-----	50
7	<b>Total</b>				<b>300</b>

**B.Sc Sugar Technology Part II: (To be approved for 2016 onwards)**

**Sem:IV ,No.Of Papers:6(Theory) 1 Practicals,1 Practicals,1 Project**

Sr.No	Paper Titles	Theory	Term Work	Practical	Project	Total
1	Equipment Design Paper:II (Evaporation and Crystallization House)	50	----	-----	-----	50
2	Capacity Calculations Paper:II (Evaporation and Crystallization House)	50	-----	-----	-----	50
3	Sugar Manufacturing Paper:I (Centrifugal)	50		100		150
4	Sugar Engineering Paper:II (Boiler and Power House)	50			100	150
5	Chemical Engineering Paper:II (Unit Opertaion)	50	-----	-----	-----	50
6	Chemical Control Paper:II (Boiling House)	50	100-	-----	-----	150
7	<b>Total</b>	<b>300</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>600</b>

**B.Sc Part II Sem:III Theory 300 Marks and Sem :IV 300 Theory + 300 Practical's,/ Project /  
Term Work Total Marks:900**

**Note:1)Term work consist of minimum 12 assignment and oral.**

**2)Project having binding report which having the information about existing machinery and equipments which are used for mechanical and Purification Process of sugar industries**

**B.Sc Sugar Technology Part III: (To be approved for 2017 onwards)**

**Sem:V ,No.Of Papers:5(Theory)**

<b>Sr.No</b>	<b>Existing Paper Titles</b>	<b>Proposed New Titles</b>
1	English	English
2	Applied Chemistry Paper:IX	Process Instrumentation and Control Paper:I
3	Advanced Sugar Engineering and Sugartechnology Paper:X	Advanced Sugar Technology Paper:V
4	Equipment Design and Capacity calculation Paper:XI	Allied Sugar Manufacturing Paper:VI
5	Elective: 1)Water management In Cogeneration Or 2)Alcohol Technology Or 3)Automation Process Control and Instrumentation Or 4)Business Management and Marketing	Elective: 1)Water management In Cogeneration Or 2)Alcohol Technology Or 3)Fundamental of Energy and its Conversion System Or 4)Business Management and Marketing

**B.Sc Sugar Technology Part III: (To be approved for 2017 onwards)**

**Sem:VI ,No.Of Papers:5(Theory)**

<b>Sr.No</b>	<b>Existing Paper Titles</b>	<b>Proposed New Titles</b>
1	English	English
2	Applied Chemistry Paper:X	Process Instrumentation and Control Paper:II
3	Advanced Sugar Engineering and Sugartechnology Paper:XIV	Advanced Sugar Engineering Paper III
4	Equipment Design and Capacity calculation Paper:XVI	Allied Sugar Co-products Paper:VII
5		

**B.Sc Sugar Technology Part III: (To be approved for 2017 onwards)**

**Sem:V ,No.Of Papers:5(Theory)**

<b>Sr.No</b>	<b>Paper Titles</b>	<b>Theory</b>	<b>Term Work</b>	<b>Practical</b>	<b>Total</b>
1	English	50	---	----	50
2	Process Instrumentation and Control Paper:I	50	----	----	50
3	Advanced Sugar Technology Paper:V	50	----	-----	50
4	Allied Sugar Manufacturing Paper:VI	50	----	----	50
5	Elective: 1)Water management In Cogeneration Or 2)Alcohol Technology Or 3)Fundamental of Energy and its Conversion System Or 4)Business Management and Marketing	50	----	----	50
6	<b>Total</b>	<b>250</b>	<b>-----</b>	<b>-----</b>	<b>250</b>

**B.Sc Sugartechnology Part III: (To be approved for 2017 onwards)**

**Sem:VI ,No.Of Papers:5(Theory) 1 Paper for In plant and Technical Essay**

<b>Sr.No</b>	<b>Paper Titles</b>	<b>Theory</b>	<b>Inplant</b>	<b>Project</b>	<b>Total</b>
1	English	50			50
2	Process Instrumentation and Control Paper:II	50			50
3	Advanced Sugar Engineering Paper III	50			50
4	Allied Sugar Biproducts Paper:VII	50			50
5	Elective: 1)Water management In Cogeneration Or 2)Alcohol Technology Or 3)Fundamental of Energy and its Conversion System Or 4)Business Management and Marketing	50			50
6	In plant Training		100		100
7	Technical essay			100	100
8	<b>Total</b>	<b>250</b>	<b>100</b>	<b>100</b>	<b>450</b>

**B.Sc Part III Sem: V thery 250 marks and Sem VI thery 250 Theory + 200 Marks Inplant training and Technical essay.**

## **B.Sc, Part II Semester III**

### **Syllabus for sugar engineering (Mill house)**

#### **UNIT 01** Cane handling and feeding [8]

1.1- Cane unloading -Bridge with trolley- having sling bar system-two motion.

1.2- Feeder table-size, slope, chain, breaking strength .power consumption etc

1.3- Cane carrier-horizontal & inclined carrier length. . Width of carrier, Speed of carrier, capacity of carrier, power consumption of carrier. Type of carrier 1) Split cane carrier.2) Rake carrier, 3) Belt carrier.

#### **UNIT 02** Cane preparations [8]

2.1-Preparation of cane,

2.2-various device of cane preparation like chopper, leveler, fibrizer and shredder.

2.3- Measurement of preparation index by bulk density method, sieving method, leaching method.

#### **UNIT 03** Mills and mill components [12]

3.1-Conventional mill.

3.2- Mill Headstocks.

3.3- Mill rollers& rollers grooving,

3.4- Messchaert groove,

3.5-lotus roller,

3. 6-Mill hydraulic and loading.

,3.7- Mill bearing,

3.8- Mill pinion,

3.9- Trash & Scraper plate,

#### **UNIT 04** Mill drives& Mills setting [8]

4.1- Mill drive- Mill drive power requirement, Prime movers for mills, Mill gearing, Mill couplings and tail bars

4.2-Mill setting-Roller setting, pressure feeder setting; underfeed roller setting, chute opening, trash plate setting, practical optimization of mill setting.

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## **B.Sc, Part II Semester IV**

### **Subject Title: Sugar engineering (Boiler & power house)**

#### **Unit 01** Steam Generation: (Boiler) [9]

- 1.1- Properties of steam,
- 1.2- Fuels (Bagasse) , characteristics of Bagasse, combustion Bagasse,
- 1.3- furnaces (Spreader Stoker & Travelling Grate),
- 1.4- Boiler, Super heater, Economizer, Air preheated,
- 1.5- Boiler accessories –feed water tank I.D.&F.Dfans Chimney ,electrostatic precipitator etc

#### **Unit 02)** Boiler water treatment [9]

- 2.1- Use of condensate.
- 2.2- Feed water specification and treatment (Internal & External),
- 2.3- DM & RO Plants, analytical control,
- 2.4- Boiler Instrumentation & Control.

#### **Unit 03** power generation (Turbine) [9]

- 3.1 Classification – description & working of extraction & condensing type turbines,
- 3.2- specific steam consumption

#### **Unit 04.** Alternator –[9]

- 4.1- sugar factory requirements, – size, type, efficiency,
- 4.2- 3 phase AC generation, and power transmission system.

Reference Book. (for both semester paper)

- 1] Hand book of cane sugar                      E.Hugot
  - 2] Cane sugar engineering                      . Peter Rain.
  - 3] Machinery & equipments of sugar factory                      L.A.Tromp
  - 4] cane sugar hand book                      R.B.L.Mathur
  - 5] Modern milling of sugar cane                      :M axwell
  - 6] standard fabrication practices of cane sugar mill                      Delden.
  - 7] the energy cane alternative,                      Alexander
- Cane sugar manufacturing in India                      D.P.Kukkarni

**PROJECTS**-Related to sugar industries -100 marks (project-75mark+oral-25mark)

Project Consist of existing machinery and equipments used for various mechanical and

Purification process of sugar industries

- 1) Name of machinery/equipment    2 ) objects    3) specification    4) operation/working**
- 5) Maintaince    6) remark-alternation /modification required.**

## **B.Sc, Part II Semester III**

### **Subject Title:Capacity calculation (Clarification house)**

**Unit 01** Capacity of weighing scale and reaction tank.[9]

1.1- Capacity of juice and imbibitions water weighing scale,

1.2- capacity of raw juice and imbibitions water pumps,

1.3- capacity of reaction tank, calculation of retention time of juice in reaction tank. Calculation forso<sub>2</sub> gas distribution system

**Unit 02.** Capacity of Equipment for process chemical [9]

2.1- Calculation of optimum dose of phosphoric acid.

2.2- Capacity of lime preparation equipments with lime pumps.

2.3- Capacity of sulphur burner and air compressor.

**Unit 03** Capacity of juice heater [9]

3.1-Calculation of Juice heater capacity,

3.2- calculation of juice velocity in the juice heater.

3.3- Calculation of number tubes and passes in the juice heater.

3.4- Calculation of juice inlet/outlet pipe size. Calculation of steam/vapor pipe size. Calculation of condensate pipe size, calculation of non-condensable gases pipe size. Calculation of tube plate diameter.

**Unit 04** Capacity of clarifier. [9]

4.1-Juice retention time in different type of clarifier

4.2-.capacity of clarifier

4.3-.capacity of clear juice pump, capacity of mud pump. Capacity of flash tank.

4.4-Capacity of rotary vacuum filter.

4.5- capacity of syrup sulphitor and syrup pumps.

## **B.Sc, Part II Semester IV**

### **Subject: Capacity calculation**

#### **(Evaporation &Crystallization house)**

##### **Unit 01** Capacity of Evaporator [9]

1.1-Co-efficient of heat transmit ion,

1.2- quantity of water evaporated,

1.3- properties of steam,

1.4- boiling point elevation.

1.5- Heating surface of evaporator station.

1.6- Calculation of individual Brix

1.7 calculation of vapor piping.

1.8- Steam requirement without vapor bleeding, steam requirement with vapor bleeding to juice heater and pan.

##### **Unit 02** vacuum pan [9]

2.1-Optimum S/V ratio of different pan.

2.2-pan capacity by massecuite %cane method.

2.3- Calculation of heating surface, and number of tubes.

2.4- Pan capacity by solid balance method,

2.5-Calculation of vapor pipe& condensate pipe size

2.6-Steam requirement of pan .

2.7-Sizing of condenser ,water requirement for condenser, capacity of injection pump.

**Unit 03** centrifugals [9]

3.1- Capacity of cooling crystallizers, quantity of water required for cooling,

3.2-Capacity of centrifugals , Capacity of runoff pump.

3.3- Capacity of melter and melt pump

3.4- capacity of final molasses weighing scale.

3.5- Capacity of superheated wash water system.

**Unit 04** finishing operation. [9]

4.1-Capacity of hopper, elevator and grader.

4.2- Capacity of hot and cold air blower,

4.3-of sugar silo.

4.4-capacity of molasses storage tank,

4.5- capacity of sugar storage godown

Reference Book( for both capacity paper.)

Hand book of cane sugar :Meade &chen

Introduction of cane sugar technology Jenkins

Unit operation in cane sugar production. Jon h. payne

Manufacturing of sugar from sugarcane. G.M. Park

Efficient management in sugar factory. Mangalsing.

Cane sugar manufacturing in India D.P.Kulkarni.

## **B.Sc, Part II Semester III**

### **Subject Title:Chemical engineering-**

#### **(Heat & Momentum Transfer)**

##### **Unit 01** Heat transfer.[9]

1.1 Conduction- Mechanism of heat transfer by conduction in solids, Fourier's law of heat transfer, Thermal conductivity, and heat loss in conduction. Thermal insulation and optimum thickness for insulation.

1.2 Convection- Heat transfer by convection, forced and natural convection, individual and overall heat transfer coefficient. Fouling factor, overall resistance Effect of drop wise and film wise condensation, , Effect of non- condensable gases.

1.3 Radiation –heat transfer by radiation. Kirchhoff's law , Stefan –Boltzmann law

##### **Unit 02** Heat transfer equipment. [9]

2.1 Heater- multipass shell and tube type heat exchanger-shell, tubes, tube pitch ligaments' (clearance), tube passes, Baffles.

2.2 Condenser-types of condenser co-current &counter current.

2.3 Derivation of overall heat transfer coefficient from hot fluid to cold fluid through metal wall

##### **Unit 03** Fluid Transfer [9]

3.1 Fluid statics- Concept of momentum transfer, Nature of fluid and pressure concept, variation of pressure with height- hydrostatic equilibrium. Barometric equation ,measurement of fluid pressure manometer.

3.2 Fluid flow –types of fluid's ,viscosity of gases and liquids. Types of flow – laminar & turbulent, Reynolds number .Basic equation of fluid flow, Average velocity, and mass velocity.continuity equation, flow of incompressible fluids. Laminar flow through circularconduit.turbulant flow through pipes, friction factor.

##### **Unit 04** Fluid transfer equipments:[9]

Pumps – positive displacement and centrifugal pumps. Fans, compressor and blower. Metering of fluids - Pipes, Fitting and valves, measurement of liquid and gas flow rates by orifice meter, venture meter, rot meter and Pitot tube.

## **B.Sc, Part II Semester IV**

### **Subject Title: Chemical engineering-(Unit operation)**

#### **Unit 01 [12]**

##### **1.1 Size reduction**

Necessity& mechanism, Rattling's law, kick's law, Bond's law, method of operating crusher, Size reduction in sugar industries.

##### **1.2 Screening**

Standard screens, capacity of screen & efficiency, Ideal and actual screen, screen analysis, equipments for industrial screening, sieve test of sugar.

##### **1.3 leaching &extraction**

Leaching techniques, perforations through solids bed, stationary bed &moving bed. Counter-current leaching, theory of diffusion. Theory of extraction of juice from cane

#### **Unit 02 [12]**

##### **2.1 Sedimentation**

Law Of settling, Stokes law, Batch settling test, Design feature of continuous thickeners, Determination of thickeners area ,factors affecting the settlings rates, Different type of settling equipments .equipments in sugar industries.

##### **2.2 Mixing &Agitation.**

Introduction, classification of mixing equipments and its application. Mixers for mixing the material. (Solid-solid &solid –liquid)

## **unit 03**

**[12]**

### **3.1 Filtration**

Theory , factors affecting filtration and remedies, filter aid and their use ,equipment used in sugar factory (Rotary vacuum filter,

### **3.2 centrifugation.**

Theory, different types of centrifugals machines –Batch &continuous, their performance study.

### **3.3 separation**

cyclone separation,membrane separation,ultrafiltration &reverse osmosis.

Reference books (for both semester paper)

Introduction of chemical engineering

Badger and Baneo

Introduction of chemical engineering

Ghosal and sanyal

Stoichiometry

Bhattand vora

**B.Sc.Part II semester- III**  
**Subject Title: Equipment design**  
**(Clarification house)**

**UNIT 01** Metals, their properties and uses in sugar industries. [4]

- 1.1 Different type of metals used in sugar industries.
- 1.2 Metal properties related to engineering/mechanical properties of metal.

**UNIT 02** Juice heaters [8]

- 2.1 Heat transfer coefficient
- 2.2 Heating surface.
- 2.3 Sizing of heater
- 2.4 Tube size and number of tubes
- 2.5 No of passes and juice inlet/outlet sizes
- 2.6 Construction of juice heater.

**UNIT 03** Juice Sulphitor [8]

- 3.1 Factors used to design continuous juice sulphitor or reaction tank.
- 3.2 Lime proportioning device (lime dosing)
- 3.3 So<sub>2</sub> gas distribution (So<sub>2</sub> gas dosing)
- 3.4 Mechanical stirrer for mixing of reagent
- 3.5 Design of tank with respect of diameter
- 3.6 Automation for ph control
- 3.7 Construction of continuous juice sulphitor

**UNIT 04** Sulphur Burners/ Furnace [8]

- 4.1 Combustion process of sulphur
- 4.2 Quantity of air required.
- 4.3 Capacity of sulphur burner.
- 4.4 Construction of sulphur burner

**UNIT 05** Juice Clarifier [8]

- 5.1 Type of clarifier
- 5.2 Functional theory of operation.
- 5.3 Retention Time
- 5.4 Flash Tank.
- 5.5 Capacity of Clarifier
- 5.6 Construction of clarifier.

## **B.Sc.Part II semester- IV**

### **Subject Title: Equipment design**

#### **(Evaporator & crystallization house)**

#### **UNIT 01** Evaporator [8]

- 1.1 Heat transfer & Evaporation coefficient
- 1.2 Heating Surface
- 1.3 Tube size and no of tubes
- 1.4 Juice/syrup inlet-out let connection
- 1.5 Sizing Triple/Quadruple/Quintuple
- 1.6 Steam requirement.

#### **Unit 02** Syrup sulphitor [7]

- 2.1 Factors used to design syrup sulphitor
- 2.2 Design of syrup sulphitor with respective to diameter.
- 2.3 Automation for Ph control.
- 2.4 Specification and construction of syrup sulphitor.

#### **UNIT 03** Vacuum Pan [8]

- 3.1 Type of pan
- 3.2 Important requirement of pan boiling used to design batch pan.
- 3.3 Different design of batch pan
- 3.4 The major design aspects used in continuous pan
- 3.5 Different design of continuous pan
- 3.6 pan capacity and heating surface.
- 3.7 Construction of pan

#### **UNIT04** Crystallizers [7]

- 4.1 Type of crystallizers
- 4.2 Horizontal v/s Vertical crystallizers.
- 4.3 Capacity of crystallizer
- 4.4 Various zones and their retention time in cooling process
- 4.5 Quantity of water required for cooling

#### **UNIT 05** Centrifugals [6]

- 5.1 Type of centrifugal
- 5.2 Gravity factor
- 5.3 Type of screen
- 5.4 Massequite curing cycle
- 5.5 DC/AC drive, variable frequency drive
- 5.6 Capacity of basket.

Reference book (for both semester paper)

Hand book of cane sugar :Meade &chen

Introduction of cane sugar technology Jenkins

Unit operation in cane sugar production. Jon h. payne

Manufacturing of sugar from sugare cane. G.M. Park

Efficient management in sugar factoty. Mangalsing.

Cane sugar manufacturing in India D.P.Kulkarni

## **B.Sc.Part II semester- III**

### **Subject Title: Chemical control**

#### **(Mill house)**

##### **Unit 01 [6]**

- 1.1) Technical definition
- 1.2) fundamental formula

##### **Unit 02 [12]**

- 2.1) Differential method for calculation of Brix %Bagasse, fibre %Bagasse, added water % fibre etc
- 2.2) Inferential method for calculation of mixed juice% cane, Bagasse %cane, added water %cane etc.
- 2.3) Clarification of some concepts like java ratio, E.R.Q.V, B.F.C.W.etc

##### **Unit 03 [12]**

- 3.1) Primary Extraction
- 3.2) Secondary Extraction
- 3.3) Mill Extraction, reduced mill extraction and whole mill extraction.

##### **Unit 04**

Control parameters and norms for mill efficiency. [6]

## **B.Sc.Part II semester- IV**

### **Subject Title:chemical control**

#### **(Boiling House)**

##### **Unit 01 [6]**

- 1.1) Technical definition
- 1.2) Basic formulas for daily manufacturing report.

##### **Unit 02 [12]**

Calculation for run report

- 2.1) Pol, Brix, Non-sugar balance
- 2.2) Clarification efficiency & clarification factory.
- 2.3) stocking & available sugar.
- 2.4) Boiling house losses.
- 2.5) Equivalent standard granulated. (ESG)
- 2.6) Conversion of raw sugar recovery into white sugar recovery by using ESG formula
- 2.7) Virtual final molasses purity.
- 2.8) Operation including & excluding stoppage.

##### **Unit 03 [12]**

- 3.1) Recorded boiling house recovery.
- 3.2) Theoretical boiling house recovery.
- 3.3) Ideal boiling house recovery
- 3.4) Boiling house recovery (ESG)
- 3.5) Reduced boiling house recovery (GUNDU RAO)
- 3.6) Overall recovery
- 3.7) Reduced overall recovery.

##### **Unit 04**

- 4.1-Control parameters and norms for efficiency. [6]

Reference book.(for both semester paper)

System of chemical control S.C.Varma

Cane sugar hand book meade and chan

Cane sugar hand book R,B,L,Mathur

Method of chemical control in cane sugar factory H.C.Prinsen Geerligs.

**TERM WORK** –Related to syllabus-100marks

Term work:75 and Oral:25

## **B.Sc.Part II semester- III**

### **Subject Title:Sugar manufacturing**

#### **(Crystallization)**

##### **Unit 01 [6]**

##### **1.1 Theory of crystallization & its zones**

- 1.2 Granting & graining methods
- 1.3 Principals & practices in graining process.

##### **Unit 02 [8]**

- 2.1 Mechanism of pan boiling.

2.2 Different massecuite boiling scheme

2.3 Principles and practices in pan boiling.

**Unit 03 [8]**

3.1 Construction of pan

3.2 types of pan

3.3 pan control & instrumentation.

**Unit 04 [8]**

4.1 cobbenz's method for purity control

4.2 calculations of massecuite %cane & molasses %cane by solid balance

4.3 Determination of crystal %massecuite.

4.4 Determination of crystal size, volume and surface area

4.5 Determination of steam requirement for massecuite boiling.

**Unit 05 [6]**

5.1 Crystallization by cooling.

5.2 Type of air and water cooled crystallizers.

5.3 Various zones and their retention time in cooling process.

5.4 Exhaustion of molasses its calculation & various factor affecting exhaustion.

## **B.Sc.Part II semester- VI**

### **Subject Title: Sugar manufacturing**

(centrifugals)

#### **Unit 01 [10]**

1.1 centrifugal theories

1.2 centrifugal forces.

1.3 Mean equivalent radius

1.4 Gravity factory.

1.5 Time cycle

1.6 Capacity of basket.

1.7 Moment of inertia

1.8 Powered required.

#### **Unit 02 [8]**

2.1 constructions of batch machine ,types of drive and control

2.2 constructions of continuous machine types of drive and control

#### **Unit:03 [8]**

##### **3.1 centrifugal operations**

- ✓ Screen washing
- ✓ Sugar washing
- ✓ Masecuite charging
- ✓ Separation of light and heavy molasses.
- ✓ Spinning and drying
- ✓ Discharging
- ✓ 3.2 Super heated wash water system

#### **Unit 04 [10]**

4.1 Drying and cooling of sugar on hopper .fluidized bed drier. Rotary drier

4.2 grading of sugar, packing of sugar.

4.3 keeping quality of sugar, storage of sugar

4.4 specification of sugar as per IS standard.

4,5 Constriction of godown & storage of molasses.

Reference books (For both semester paper)

Principle of sugar technology vol I P. Honig

Principle of sugar technology vol II P. Honig

Principle of sugar technology vol III P. Honig

Hand book of sugar refinery chung chi chou

Manufacturing and refining of raw sugar Baikow

By product of cane sugar industries Paturau.

## Practical's List

Sugar Manufacturing:-100 marks

- 1) Determination of pol percent cane by rapi pol extractor
- 2) Determination of fiber percent cane by rapi pol extractor
- 3) To find out expected recovery by lab crusher.
- 4) Determination of CaO content in mixed juice and clear juice.
- 5) Determination of P<sub>2</sub>O<sub>5</sub> in mixed juice and clear juice.
- 6) Analysis of final molasses for purity, reducing sugar. total reducing sugar, and ash % of molasses.
- 7) To determine size of slurry. Size of seed and size of sugar crystal by microscope.
- 8) Determination of crystal content of Masscuite by Nutsh Apparatus / lab centrifuge machine
- 9) Determine the viscosity of given sample by Digital viscometer.
- 10) Determine the shock liming dose for clarification process.
- 11) Determination of Ash by conductometry.
- 12) Determination of grade & color of sugar by visual method.