Chittagong Veterinary and Animal Sciences University
Faculty of Food Science and Technology
BFST 4th Year 1st Semester Final Examination, 2014
Subject: Refrigeration, Air Conditioning and Food Processing (Theory)
Course Code: RAP-401(T)

Full Marks: 70 **Time: 3 hours**

(Figures in the right margin indicate full marks. Answer **Four (4)** questions from each section where question **1** & **6** are compulsory. Use separate answer script for each section. Split answer is discouraged.).

Section-A

1 Discuss the relationship between Refrigeration and Air Conditioning system. 5

2. a) Explain Time-Temperature-Transformation diagram for refrigeration. Draw a simple diagram of Ammonia Absorption refrigeration system and explain its operating principles. 6
   b) Mention the properties that you need to consider in selecting a refrigerant. 4

3. a) Enumerate in brief the elimination of water in refrigeration system and test for leakage of refrigerant. 4
   b) Describe the following refrigeration equipment's: (i) Condenser, (ii) Compressor and (iii) Evaporators. 6

4. a) What do you mean by defrosting? List the cooling load components for an air conditioning system. 5
   b) Draw a skeleton psychrometric chart and explain the following process: (i) cooling and dehumidification, (ii) Heating and humidification and (iii) Bypass factor. 5

5. a) Give the classification of an air conditioning system. Design summer air conditioning system (with single cooling coil and mixing) and summer air conditioning system (with single cooling coil and by pass mixing), also represent its psychrometric process. 6
   b) Describe the interspace noise control and biological attributes of ethylene. 4

Section-B

6. Explain the application of psychrometry in food processing. 5

7. a) Define COP. Write down the working principle of a cascade refrigeration system. 5
   b) Explain the following term: (i) Psychrometric properties of air, (ii) Percentage Humidity, (iii) Wet bulb temperature and (iv) Adiabatic saturation. 5

8. a) Describe the procedure for calculating cooling loads in refrigeration and air conditioning system. 6
   b) List the factors governing optimum effective temperature. 4

9. a) Define emissivity of the body. Develop an expression for Quantity of heat transferred for parallel flow through a heat exchanger. 5
   b) Calculate the heat loss per unit length from a 20 cm steel pipe of 4 mm thickness, carrying saturated steam and insulated with 4 cm thick layers of asbestors and 2 cm thick outer layer of magnesia. The inside film co-efficient is 3000 kcal/m^2-hr-^{0}C and outside film co-efficient is 12 kcal/m^2-hr-^{0}C. The ambient and steam temperature are 35^{0}C and 250^{0}C respectively and K (pipe) =300 kcal/m-hr-^{0}C, K (asbestors) =20 kcal/m-hr-^{0}C, and K (magnesia)=15 kcal/m-hr-^{0}C. 5

10 a) Design a hydro cooling and vacuum cooling cold storage preservation chamber and mention how you will calculate cooling time in produce. 5
   b) Two air steams are being mixed at the following rates: No1. Steam flowing at 160 kg/min having 27^{0}C dbt and 21^{0}C wbt and No2. Steam is flowing at 100 kg/min having 20^{0}C dbt and 50% rh. After mixing the mixture is sensibly heated 10^{0}C,while the heater efficiency is 90%. Determine the psychrometric properties of the final mixture. 5

Chittagong Veterinary and Animal Sciences University
Faculty of Food Science and Technology
BFST 4th year 1st Semester Final Examination, 2014
Subject: Epidemiology and Public Health (Theory)
Course Code: EPH-401

Full Marks: 70 **Time: 3 hours**

(Figures in the right margin indicate full marks. Answer **Four (4)** questions from each section where question **1** & **6** are compulsory. Use separate answer script for each section. Split answer is not allowed.)

Section-A

1. a. Define epidemiology. Give explanation of distribution, determinations and health related states and events. 3
   b. What are the core epidemiologic functions? 2

2. a. What are the consideration factors to establish the cause of a disease? 5
   b. An outbreak of shigellosis in which 18 persons in different households all become ill. The population of the community was 1000. One incubation period later, 17 persons in the same households are these, primary cases develop shigellosis. The 18 household included 86 persons. Calculate attack rate and secondary attack rate. 5

3. a. Briefly explain the disadvantages of cross-sectional study design. 2
   b. What is blinding? Which study design uses this technique and why? 3
   c. A researcher follows 200 women who exercise regularly and 300 women who do not exercise regularly. After 30 years of follow up, 20 of the women in the exercise group and 30 women in the non-exercise group are diagnosed with osteoporosis. Calculate the relative risk of developing osteoporosis between the two groups. 5

4. a. Place appropriate choices in the blank cells of the following table 5

Known epidemiological information	Would like to know about	Appropriate study design	Measures of association
Exposure	Multiple outcome		
Disease burden	Multiple exposure		
None	Exposure		

   b. The diabetes follow up study included 218 diabetic women and 3823 non-diabetic women by the end of the study. 72 of the diabetic women and 511 of the non-diabetic women had died. The diabetic women were observed for a total of 1862 person-years, the non-diabetic women were observed for a total of 36653 person-years. Calculate the incidence rates of death for the diabetic and non-diabetic women. 5

5. a. Define sampling. Classify sampling techniques used in epidemiology. 4
   b. Some researchers carried out a study of sudden unexpected death in men. Data on smoking history are shown in the table below 6

Cases	controls		
	Smoking 1+ pack/day	Smoking <1 pack/day	Total
Smoking 1+ pack/day	2	36	38
Smoking <1 pack/day	8	34	42
	10	70	80

   i. Calculate matched pairs odds ratio for these data.
   ii. Unmatched the pairs and calculate unmatched odds ratio.

Section-B

6. a. Give a schematic layout for cohort study. 3
   b. Enlist the advantages and disadvantages of case- control study design. 2

7. a. Enlist different types of surveillance system. 2

b. Describe face validity and consensual validity. 2

c. In an outbreak of chicken pox, disease was diagnosed in 18 of 152 vaccinated children compared with 3 of 7 unvaccinated children. Calculate risk ratio and vaccine effectiveness. 6

8. a. The sensitivity and specificity of PCR for the diagnosis of viral hepatitis in human was estimated as 95% and 90% respectively. How will you interpret each percentage? 3

b. Briefly explain sampling error. 2

c. 100 people are tested for a specific disease. 15 people have the diseases; 85 people are not diseased. A screening test detected. 10 true positive and 45 true negative cases. Calculate sensitivity and specificity of that test. 5

9. a. Differentiate between prevalence and incidence. 2

b. What are rate, ratio and proportion? 2

c. 6

Live births by sex	
Sex	**Number**
Male	2069490
Female	1971468
Total	4040958

Deaths by age and sex			
Age group	**~~Rate~~** Male	**Female**	**Total**
<28 days	14059	11109	25168
28 days- 11 months	8302	6185	14487
1-4 years	4110	3182	7292

From the above information calculate the ratio of infant mortality rates for males versus females.

10. a. What is ethics? What are the principles of bio-medical ethics? 3

b. A boy's hostel consists of 400 boys. Due to a highly contagious emerging disease of unknown origin, 80 boys were found sick during an outbreak investigation 30 boys died during various stage of outbreak. Based on the information, calculate the morbidity and case fatality of the mentioned disease. 4

c. In 2005, 7025 new cases of AIDS were in Dhaka. The estimated mid-year population of the place was approximately 89058299. Calculate the incidence rate of AIDS in 2005. 3

Chittagong Veterinary and Animal Sciences University
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BFST 4th Year 1st Semester Final Examination 2014
Subject: Statistics (Theory)
Course Code: STC- 401

Full Marks: 55 **Time: 3 hours**

(Figures in the right margin indicate full marks. Answer any **03 (three)** questions from each section where question no. 1 **is** compulsory. Use separate answer script for each section. Split answer is discouraged).

SECTION-A

1. a. Define population and sample with example. 2
   b. State the nature of the variables of the followings: 3
   Colors of a fruit, Economic status of a worker, Storage temperature of food items, Age of a sales man, Number of eggs laid by a hen, Weight of rice.
   c. What are the most commonly measures of central tendency? If, the arithmetic mean and harmonic means of two positive quantities are 8 and 2 then find the geometric mean. 5

2. a. Define simple linear regression with an example. Write the properties of regression co-efficient. 2
   b. Prove the relationship between correlation coefficient and regression coefficients. 3
   c. The following data relate the advertising expenditure (in lakh taka) and sales (in Crores of Taka) of Khulshi Mart in a year: 4

Advertising Expenditure (in lakh Taka)	10	12	13	17	18
Sales(in crore Taka)	5	6	7	9	13

   i. Estimate the regression equation of sales on advertising expenditure.
   ii. Predict the sales target for advertising expenditure of Tk. 20 lakh.

3. a. Define binomial distribution with some properties. 2
   b. What do you mean by mutually exclusive event, sure event and sample space? 3
   c. Suppose monthly food expenditure for families of four in Chittagong is on average BDT 15000 and has a standard deviation of BDT 500. Assuming the monthly expenditure is normally distributed. 4
      i) Find the probability that monthly food expenditure is less than BDT 14000
      ii) Also find the probability that monthly food expenditure is between BDT 14000 to BDT 16000.

4. a. Distinguish between 3
      i) Hypothesis and statistical hypothesis
      ii) First kind of error and level of significance
      iii) Second kind of error and power of a test.
   b. Write down the names of the test statistics. Define z and t tests. 3
   c. The owner of a poultry farm claims that the average weight of chickens of his farm is 1.5 kg with standard deviation 0.5 kg. A sample of 9 chickens from this farm gives average weight 1.3 kg. Test the claims of the owner at 5 % level of significance. Use 3

$$\left| Z_{.025} \right| = 1.96$$

SECTION-B

5. a. What are the important measures of dispersion? Which one is the best measures of dispersion and why? 5
   b. Suppose sweetmeat shop ' Flavors' has two shops in Chittagong. One shop is located at GEC and the other is at Khulshi. Each shop is run by a different manager and each manger claims that his shop's layout maximizes the amounts of customers will purchase impulse. Both managers surveyed a sample of their customers on how much they spend on impulse. The following table shows the data-

Particulars	GEC Flavors	Khulshi Flavors
Mean	47	58
Variance	2.3	3.5
Size	20	25

Test if there is a difference in the mean amounts purchased on impulse at two shops. 4

6. a. Define simple event and compound event with example. 2
   b. State addition and multiplicative laws of probability. When two events are said to be independent? 3
   c. Suppose P [A] = 0.8, P[B] = 0.7 and P[AB]=0.56. Find P[B], P[AB], P[AUB]. Are the events A and B independent? 2

7. a. Define treatment, block, experimental unit and yield with an example of each. 3
   b. Distinguish between CRD and RBD. Set an example in your field where you can apply RBD instead of CRD. 4
   c. In what circumstances RBD will turn into CRD? 2

8. Write short notes on: **(Any three)** 3 x 3= 9
   i. Rank correlation (ranks are equal)
   ii. Principles of experimental design
   iii. Latin square design
   iv. Skewness and Kurtosis.

Chittagong Veterinary and Animal Sciences University
Faculty of Food Science and Technology
BFST 4th Year 1st Semester Final Examination, 2014
Subject: Leadership and Food Entrepreneurship Development (Theory)
Course Code: FED-401

Full Marks: 55 **Time: 3 hours**

(Figures in the right margin indicate full marks. Answer any **03 (three)** questions from each section where question no. **8 is** compulsory. Use separate answer script for each section. Split answer is discouraged).

SECTION-A

1.	a.	Write the concept of "Entrepreneurship" and "Entrepreneurship Development".	3
	b.	State the qualities of a good "entrepreneur".	3
	c.	What are the prerequisites that are essentially required to star an enterprise?	3
2.	a.	Define Small and Medium Enterprise in context of Bangladesh.	3
	b.	State the role of extension services in strengthening of **SME** in the urban and peri-urban areas in Bangladesh.	3
	c.	State the concept of cooperative in developing **SME**.	3
3.	a.	Define entrepreneurial competency. How competency will have to be developed?	4
	b.	Describe the process of developing entrepreneurial competencies.	5
4.	a.	Define opinion leader. Write the types of opinion leader.	2
	b.	Write down comparison between authoritarian and democratic leadership.	4
	c.	Briefly discuss the responsibilities of professional leaders.	3

SECTION-B

5.	a.	Define project. What steps should be followed for selecting a project?	5
	b.	Briefly discuss the sources of financing of an enterprise.	4
6.	a.	What do you mean by project report? State the components of project report.	3
	b.	Briefly discuss the project formulation process.	4
	c.	State the common errors in project formulation.	2
7.	a.	State the concept of "urban enterprise" and "rural enterprise"	2
	b.	What are the favorable factors that are prevailing for the development and growth of urban enterprise in Bangladesh?	4
	c.	State the basic requirements to a rural enterprise in present context to Bangladesh.	3
8.		Write short notes (any four)	4 x 2.5 = 10

i. Ownership structure of SME
ii. Entrepreneurial mobility
iii. Qualities of local leaders
iv. Value chain in food industry
v. Role of NGOs in developing rural food industry.

Chittagong Veterinary and Animal Sciences University
Faculty of Food Science and Technology
BFST 4th Year 1st Semester Final Examination, 2014
Subject: Extension Communication Management(Theory)
Course Code: ECM-401(T)

Full Marks: 55 **Time: 3 hours**

(Figures in the right margin indicate full marks. Answer Three (3) questions from each section where question 1 is compulsory. Use separate answer script for each section. Split answer is discouraged.).

Section-A

1 a) Explain the terms of Extension and Agricultural Extension. 3
b) Extension is a continuous process.- Explain. 3
c) Discuss the scope of extension in food sector of Bangladesh. 4

2. a) Define innovation. State the different types of innovation with examples. 4
b) What are the important factors in determining whether an individual will adopt or reject an innovation? 5

3. a) What are the elements of human resource management in an organization? 2
b) Why human resource development is necessary for an extension organization? 3
c) Briefly describe different types of training for working in an extension service. 4

4 a) Define monitoring and evaluation. 2
b) State different types of evaluation. 4
c) What are the tools of monitoring? 3

Section-B

5. a) Define communication. Explain the process of communication following Berlo's model. 5
b) Discuss the functions of extension communication. 4

6. a) What is leadership? 2
b) Why local leader are important for extension programme implementation? 3
c) Give a brief comparison between professional leader and local leader. 4

7. a) What do you understand by programme planning in extension? 2
b) Suppose you are responsible for developing an extension programme for safe food production in an Upazila. Discuss the steps for programme of it. 7

8. Write short notes on (any three of the following): 3x3= 9
i. Formal and non-formal education
ii. Noise in Communication
iii. Adapter category
iv. Innovation decision process.

Chittagong Veterinary and Animal Sciences University
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BFST 4th Year 1st Semester Final Examination, 2014
Subject: Poultry Products Technology (Theory)
Course Code: PPT-401

Full Marks: 55 **Time: 3 hours**

(Figures in the right margin indicate full marks. Answer any **03 (three)** questions from each section where question no. **1 of section A** is compulsory. Use separate answer script for each section. Split answer is discouraged).

Section-A

1. a) State the concept of poultry products technology. 3
   b) State the scope of "Poultry Products Technology" in relation to rapid growth of urbanization. 4
   c) Enumerate the present status of production and utilization of poultry products in Bangladesh. 3

2. a) Define pickled chicken and sweet-sour chicken. 2
   b) State a note on pickled chicken. 4
   c) Enumerate the common defects of pickled and sweet-sour chicken during preservation with remedial measures. 3

3. a) What is a "food additive". State four examples of food additives. 3
   b) What are the uses of food additives in broiler industries? 3
   c) State the definition of extenders, fillers and binders. 3

4. Write short notes (Any three) 3×3=9
   a) Chicken roll b) Biochemical parameters in poultry meat inspection
   c) Frozen and dried eggs d) Chicken sandwich e) Macaroni egg noodles

Section B

5. a) Define HACCP and discuss its seven principles. 3
   b) Describe in brief the defects of poultry meat and poultry products. 6

6. a) Write down the various methods of stunning birds. 4
   b) With figure describe the different parts of chicken's egg. 5

7. a) Explain the following terms: SOP, GMP and CCP. 3
   b) Prepare a summary of specification for standard of quality for individual carcasses for ready-to-cook chicken. 6

8. a) Define poultry inspection. Give the diagram of a poultry processing plant. 4
   b) Illustrate the organoleptic parameters of chicken. 5

Chittagong Veterinary and Animal Sciences University
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BFST 4th Year 1st Semester Final Examination, 2014
Subject: Marketing of Food Products and Business Management(Theory)
Course Code: FMB-401

Full Marks: 70 **Time: 3 hours**

(Figures in the right margin indicate full marks. Answer any **03 (three)** questions from each section where question no. **1 and 5** are compulsory. Use separate answer script for each section. Split answer is discouraged).

SECTION-A

1.	a.	What is meant by distribution channel?	2
	b.	Discuss the different types of distribution channels?	6
	c.	What are the factors lead to selection of direct channel?	3
2.	a.	How would you explain the statement that middlemen may be eliminated but their functions cannot be avoided?	5
	b.	What do you mean by marketing functions?	3
	c.	What is the difference between mass selling, personal selling, and sales promotion?	4
3.		Define marketing system. Briefly discuss the marketing system of milk and milk products in context of Bangladesh.	12
4.	a.	What is meant by business?	3
	b.	Discuss the requisites for attaining success in business.	6
	c.	Do you think earning profit is the sole objective of a business?	3

SECTION-B

5.	a.	What do you understand by inventories? Write the different forms of inventories.	4
	b.	What factors should be considered for a plant location of a food industry?	5
	c.	Write the advantages for proper selection of plant layout.	2
6.	a.	Define marketing research. Briefly discuss the scope of marketing research.	5
	b.	Describe the procedures for conducting a marketing research.	5
	c.	State the limitations of marketing research.	2
7.	a.	How would you classify products? Identify the product class for food.	4
	b.	Do you support brand name for agricultural commodities such as banana, brinjal and beef?	5
	c.	Discuss the four stages in a product life cycle.	3
8.		Write short notes (any four)	4x3 = 12

i. Marketing margin and marketing efficiency
ii. Economic Ordering Quantity
iii. Marketing MIX
iv. Whole selling and retailing
v. Operative capital management

Chittagong Veterinary and Animal Sciences University
Faculty of Food Science and Technology
BFST 4th Year 1st Semester Final Examination, 2014
Subject: Food Quality Control and Assurance (Theory)
Course Code: FQA-401

Full Marks: 70 **Time: 3 hours**

(Figures in the right margin indicate full marks. Answer **Four (04)** questions from each section where questions **1 and 6** are compulsory. Use separate answer script for each section. Split answer is discouraged).

Section-A

1 What do you mean by quality assurance and certificate of Analysis? What are the activities of quality control departments? 5

2. a) What is Beer-Lambert's law? A solution with a concentration of 0.15 M is measured to have an absorbance of 0.59. Another solution of the same chemical is measured under same conditions and has the absorbance of 0.47. Is it possible to determine the concentration of this unknown solution? If so, what is the concentration of this solution? 6
   b) Discuss in details the parts and functions of double beam spectrophotometer. 4

3. a) Why proper storage condition is required in food industry? 3
   b) Briefly describe the principles of quality control system. 4
   c) What do you mean by ISO 9000 series? 3

4. a) Define AAS. Write the principal stages of getting light source in AAS. 6
   b) Why calibration and background correction are required? How unknown concentration of a sample can be determined? 4

5. a) What are HPLC phases? Write the principles of reverse phase HPLC. 6
   b) Write short notes on "Retention time" and "Detector". 4

Section-B

6. Describe in details the general principle of chromatography. 5

7. a) Write down five quality factors with their measurement process. 5
   b) Write down five types of food adulterants with their health effects. 5

8. a) What is rheology? Which types of properties of a substance are related to rheology? What do you mean by Newtonian and non-Newtonian fluid? 6
   b) Discuss the sensory evaluation methods of liquid food with respect to viscosity. 4

9. a) Explain the various applications of the ultraviolet spectroscopy. 6
   b) Discuss the effect of the polarity of the solvent on the various types of transitions in the UV-Spectroscopy. 4

10. a) Illustrate the following terms: 4
    i) Limited uses of colours
    ii) Minerals colours
    iii) Banned colours
    iv) Natural food dyes.
    b) Describe the procedure for the detection of colouring agents of food. 6

Chittagong Veterinary and Animal Sciences University
Faculty of Food Science and Technology
BFST 4th Year 1st Semester Final Examination, 2014
Subject: Renewable Energy in Food Processing
Course Code: RFP-401(T)

Full Marks: 70 **Time: 3 hours**

(Figures in the right margin indicate full marks. Answer **any Four (4)** questions from each section where question no. 1 and 6 are compulsory. Use separate answer script for each section. Split answer is discouraged.)

Section-A

1. a) What do you mean by Renewable and non-renewable energy sources? How does the future direction of human life depend on efficient use of renewable energy sources? 03
   b) Write short notes on the following conventional energy sources 02
      i) Coal ii) Natural gas

2. a) Describe the essential scientific principle for a successful renewable energy system to run smoothly? 05
   b) State photovoltaic effect with mentioning its important characteristics. 03
   c) Why do usually the actual output power from a PV module is less than its rated power? 02

3. a) State and explain the fundamental theory of Betz for the design and operation of wind turbines. 06
   b) Design a solar PV system to run 2 compact fluorescent lamps(18 watt each) and two fans (60 watt each) for 6 hours per day by bringing the following data into account: 04
   The combined efficiency 0.81; Battery voltage used for operation is 12 volts; Battery capacity is 120 Ah; Sunlight available in a day is 8 hours; PV panel power rating is 40 Wp and operating factor is 0.75.
      i) What is the total load?
      ii) Which PV module and battery is available for use?

4. a) Explain the construction details and working principle of a typical Biogas plant. 04
   b) Explain briefly the factors on which the energy content of Biomass product depends. 06

5. a) What is geothermal energy? Explain the geothermal energy as a source of renewable energy. 03
   b) What do you mean by the term "Geothermal Reservoirs"? Explain the differential techniques used to generate electricity from geothermal sources in geothermal power plants. 04
   c) A boy's hostel in a school needs 5000 litres of hot water. Solar radiation available on the location is 6.2 kwh/m^2 day. Temperature of feed water is 27^0 C and it is to be heated up to 60^0C. Find out the collector area required for the system. Efficiency of solar water heat is 0.40. 03

Section-B

6. a) What do you mean by direct, diffuse and global solar radiation? The amount of solar radiation reaching the earth surface is less than the extraterrestrial radiation – why? 03
   b) Define Air Mass (AM). The amount of radiation received for AM 1.5 will be more than that for AM 1-Explain. 02
7. a) Write down the advantages and disadvantages of application of renewable energy technology in Bangladesh. 05
   b) Mention some renewable energy sources for the food processing industries in Bangladesh. 05

8. a) What do you mean by the term" Tip Speed Ratio or TSR" for a wind turbine machine? Derive an expression for the optimal rotational frequency of rotor blades in a wind stream to extract maximum power. 04

b) Explain the workings of different components in a horizontal axis wind turbine machine. 06

9. **a)** Explain three main types of tide phenomena at different locations on the earth briefly. 05

b) Classify waves mentioning their anatomy and also with appropriate reasoning. 03

c) Write short notes on the following thermo-chemical processes 02

i) Gasification ii) Pyrolysis

10. a) Explain the construction details and working principle of a box type solar cooker. 05

b) Design a solar still to produce 250 litres of distilled water per day for a small village community. Following assumptions can be taken into account: 05
Latent heat of water evaporation is 2260 kJ/kg; Density of water is 1 kg per litre; Efficiency of solar still is 0.30; Average daily solar radiation on a given location is 7 Kwh/m^2-day. What will be the area of the solar still to fulfill the requirement?

Faculty of Food Science and Technology
BFST 4th Year 1st Semester Final Examination, 2013
Subject: Food Quality Control and Assurance
Course Code: FQA-401

Full Marks: 70 **Time: 3 Hours**

(Figures in the right margin indicate full marks. Answer four questions from each section where question no. **1** and **6** are compulsory. Use separate answer script for each section. Split answer is discouraged)

Section: A

What do you mean by Quality Control and Quality Assurance? Give an example. What are the objectives of them? 5

a) Which information is necessary for raw material specifications? 5

b) How product failures are related to raw materials? 5

a) Write the names of most common coloring agents with their chemical structures. 4

b) Using spectrophotometer, describe the procedure of identification of food dye. 6

a) What is mass spectroscopy? Describe the function of mass spectrometer with flow diagram. 6

b) Discuss in details the nature of an atom when absorbed electromagnetic radiation. 4

a) What is chromatography? How dose chromatography work? 5

b) Discuss the function of GLC with flow diagram. 5

Section: B

a) What is theoritical plate? How can you determine the efficiency of a column using theoritical plate? 5

a) Describe in details the Munsell color system. 5

b) What do you mean by Hunter Lab and CIE Lab? What are the relations between Hunter Lab and CIE Lab? 5

a) What is Beer-Lambert law? Derive the equation of Beer-Lambert law. 6

b) Describe the deviation of Beer-Lambert law. How can you use this equation for chemical analysis? 4

a) What is HPLC? Discuss in details the instrumentation of HPLC. 6

b) What are HPLC phases? Write down the separation technique of reverse phase HPLC. 4

a) What do you mean by Carbon Load and End capping? 4

b) What is interaction? Discuss the nature of interaction of benzene, naphthalene and anthracene in reverse phase HPLC. 6