B.Sc. 3rd Semester (Honours) Examination, 2018 (CBCS)

Subject : Chemistry

Paper : SEC-I

Time: 2 Hours **Full Marks: 40**

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Candidates are instructed to attempt either **Section-A** *or* **Section-B**

Section–A

(Basic Analytical Chemistry)

1. Answer *any five* questions from the following: 2×5=10

(a) What do you mean by significant figure?

(b) Name one each of masking and demasking agents used in complexometric titration.

(c) Define ion-exchange capacity with its unit.

(d) What is the main ingredient in antiperspirants?

(e) What is meant by the term NPK?

(f) Name two principal type of sampling procedures for analysis of natural and waste water.

(g) How could you detect the metanil yellow present in the adulterated food?

(h) Choose the better result of the following with reasons:

(i) 0·80g. was reported as 0·79g.

(ii) 1·70g. was reported as 1·68g.

2. Answer *any two* questions from the following: 5×2=10

(a) Discuss the principles of thin layer chromatography. What is R_f value? 4+1=5

(b) Write a brief note on organic and inorganic species, found in contaminated water. 5

(c) (i) Write down the advantages of multidentate chelating ligands for complexometric titration over monodentate ligands.

(ii) What is metallochromic indicator? 4+1=5

(d) Write down the characteristics of an ion-exchange resin. Classify ion-exchange resin. What are different functional groups present in each kind? 3+1+1=5

3. Answer *any two* questions from the following: 10×2=20

(a) What are different layers of soil? Classify the soil mentioning their composition. What is the role of pH in soil? How to control the pH of soil? 2+4+2+2=10

(b) (i) Name some methods of food preservation used in industry.

(ii) Name the adulterant used in sugar and coffee powder. What are their harmful effects?

(iii) Use of sodium benzoate as preservative is harmful—justify. 4+4+2=10

(c) (i) Distinguish between accuracy and precision. Explain "high precision of the data does not warrant high accuracy of the result."

(ii) Define constant and proportional error with examples. (3+3)+4=10

(d) (i) Name chemical compounds present in talcum powder.

(ii) Mention two major chemical ingredients in lipstick.

(iii) Mention the role of following ingredients in cosmetics:

(A) Zinc oxide

(B) boric acid

(iv) Write two applications of chromatographic technique. Classify chromatographic techniques based on the nature of mobile phase. 2+2+(1+1)+(2+2)=10

Section-B
(IT Skill in Chemistry)

1. Answer *any five* questions from the following: 2×5=10

(a) Calculate the relative error by approximating $\frac{5}{3}$ by 1·6667.

(b) Obtain the iteration function to find a real root of the equation $x^2 - x - 0{\cdot}2 = 0$ lying between 1 and 2.

(c) Compute $\int_0^1 (1+x)dx$ by Simpson's $\frac{1}{3}$ rule with space length 0·5.

(d) Find the units of the van der Waals constants 'a' and 'b' in S.I. unit.

(e) Find the equation of the tangent to the curve $y = x^2 - 4x + 2$ at (4,2)

(f) Find the mean deviation about the mean for the following data:

6, 7, 10, 12, 13, 4, 8, 12

(g) Perform the following addition:

$(1010{\cdot}101)_2 + (110{\cdot}001)_2 + (1111{\cdot}111)_2$

(h) Why the two symbols 0 and 1 are used to store and process data inside a computer?

2. Answer *any two* from the following: 5×2=10

(a) Obtain Simpson's 1/3 rule for numerical integration.

(b) Compute by the method of iteration the positive root of the equation

$x^2 - x - 0{\cdot}1 = 0$

correct up to three significant figures.

(c) Obtain a numerical differential formula for solving ordinary initial value problem $\frac{dy}{dx} = f(x,y)$ with $y(x_o) = y_0$.

(d) Write short notes on:

(i) Binary Number System

(ii) Constant and variable in computer programming 2½+2½=5

3. Answer *any two* from the following: 10×2=20

(a) (i) What is uncertainty of measurement?

(ii) How can you express uncertainty of measurement?

(iii) Why is uncertainty of measurement important? 3+4+3=10

(b) (i) Write short notes on:

(I) Principle of least-square

(II) Data representation in a computer

(ii) Obtain $\frac{dy}{dx}$ if $= \sqrt{\frac{(x-3)(x-4)}{(x-5)(x-6)}}$. (3+4)+3=10

(c) (i) Draw the graph of $f(x) = 2 + |x^2 - 4|$.

(ii) Use the method of least square to fit a straight line to the data: 4+6=10

x	60	61	62	63	64
y	40	42	48	52	55

(d) (i) Write a Basic computer program which adds two given matrices of same order.

(ii) Calculate the Arithmetic Mean and Standard Deviation of the following frequency distribution:

Class Interval:	0–9	10–19	20–29	30–39	40–49	50–59
Frequency:	15	20	25	24	12	34

5+5=10