*This question paper contains 5 printed pages.*

1

*Your Roll No. .....*

I

| | |
|---|---|
| *S. No. of Paper* | : **150** |
| *Unique Paper Code* | : **42353503** |
| *Name of the Paper* | : **Statistical Software R** |
| *Name of the Course* | : **B.Sc. (Math. Sc.) / B.Sc. (Prog.) : SEC** |
| *Semester* | : **V** |
| *Duration* | : **2 hours** |
| *Maximum Marks* | : **38** |

28/11/18

*(Write your Roll No. on the top immediately on receipt of this question paper:)*

***All questions are compulsory.***

***All commands should be written using language R.***

1. Do any *four* of the following: 1×4

   State whether the following statements are true or false:

   (i) R follows the BODMAS rule for the calculation of mathematical expressions.

   (ii) c( ) command is easier than scan( ) command.

   (iii) rm( ) is used to find the variables defined.

   (vi) getwd( ) and setwd( ) are same commands.

   (v) sort( ) command can perform on an entire data frame.

2. Do any *six* of the following: 1×6

   Fill in the blanks:

   (i) table( ) command shows the ..... of the data. ( frequency/density)

   (ii) How many columns are present in a basis stem and leaf plot? (two/three)

P. T. O.

(iii) ..... command is used to make bar charts. (boxplot( ) / barplot( ))

(iv) ..... command is used to generate a sequence of 10 random numbers. (seq(10) / rseq(10))

(v) names( ) command is used for viewing ..... (rows/columns)

(vi) To generate ten Poisson distributions with mean lemda=1, we use command:

( rpois(10,lemda=1), qpois(1,lemda=10)).

(vii) $ command is used for ..... (copy a data, extract from a data).

3. Do the following questions: 2x8

(a) Write commands for the following:

(i) To remove all the variables beginning with 'e' defined.

(ii) To save the variables a=3, b=10 and c=5 in a different file.

(b) Write command to compute:

(i) $\frac{2+100}{5+e}$

(ii) $\tan^{-1}(1)$ in degree.

(c) Write the difference between lapply and sapply.

(d) Create scatter plot for two dimensional data with *one* example.

(e) Consider a matrix X:

| | Q1 | Q2 | Q3 | Q4 |
|---|---|---|---|---|
| R1 | Jan | Apr | Jul | Oct |
| R2 | Feb | May | Aug | Nov |
| R3 | Mar | Jun | Sep | Dec |

(i) Write command to change the names of rows with a, b, c and names of columns with A, B, C, D respectively.

(ii) Print all items of 2nd column.

(f) Rearrange the data in increasing order and draw a stem and leaf plot where data are:

X=3, 5, 7, 5, 3, 2, 6, 8, 5, 6, 9

(g) Make a score data file:

| | | | |
|---|---|---|---|
| 81 | 81 | 96 | 77 |
| 95 | 98 | 73 | 83 |
| 92 | 79 | 82 | 93 |
| 80 | 86 | 89 | 60 |
| 79 | 62 | 74 | 60 |

Find the range, mean, median, standard deviations.

(h) By using data1 = 3, 5, 7, 6, 9, 2, 7, 1, write a sequence of items of data1 with:

(i) only even positioned items.

(ii) only odd positioned items.

4. Do any *four* of the following: 3×4

(a) Write the commands for the following:

(i) How to make a comment in R?

(ii) Create a vector

y: 12, 7. 5, 3, 4.2, 18, −21, NA, 6, NA.

(iii) Find the length of vector y.

(iv) Find mean of vector y by dropping NA values.

(v) Find the quartile of vector y.

(b) Consider the matrix:

>Marks

| | Physics | Chemistry | Maths |
|---|---|---|---|
| Jim | 73 | 84 | 82 |
| Sui | 75 | 68 | 58 |
| Andy | 90 | 85 | 73 |
| Jojo | 69 | 63 | 71 |
| Pi | 81 | 84 | 73 |

(i) Find the mean of the third column of Marks.

(ii) Find the median of all columns of Marks.

(iii) Find the column means of Marks.

(iv) Create a table of matrix Marks.

(v) How can you make a scatter plot of Physics *versus* Maths and display a line of best-fit?

(c) Make a dataframe file:

| | | |
|---|---|---|
| 81 | 81 | 96 |
| 95 | 98 | 73 |
| 92 | 79 | 82 |
| 80 | 86 | 89 |
| 79 | 62 | NA |

Then convert this data into a matrix.

(d) If a data2 file is given as:

data2=3, 5, 8, 7, 9, 6, 8, 6, 3, 5, 4, 7, 3, 6, 2,

Which test would you apply to compare this sample to normal distribution? Also write command.

(e) Write a program in R for the following:

(i) Consider the given data:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| $x$ | 5 | 6 | 13 | 4 | 12 | 10 | 16 | 5 |
| $y$ | 4 | 4 | 16 | 18 | 19 | 12 | 16 | 20 |

(ii) Draw a scatter plot of data points $(x, y)$.

(iii) Find correlation between and $x$ and $y$.

(iv) Compute a line of best fit for the data.

(v) Add the line of best fit to the scatter plot.

(2)

***This question paper contains 3 printed pages.***

*Your Roll No.* 29/11/18

I

*Sl. No. of Ques. Paper* : **264**

*Unique Paper Code* : **32223904**

*Name of Paper* : **Basic Instrumentation Skills**

*Name of Course* : **B.Sc. (Hons.) / B.Sc. (Prog.) Physics : SEC**

*Semester* : **V**

*Duration* : **3 hours**

*Maximum Marks* : **50**



*(Write your Roll No. on the top immediately on receipt of this question paper.)*

*Attempt any five questions.*

1. (a) Give step by step method to read 4-band color codes of carbon resistor. What is the significance of tolerance band in this type of coding? Write colour codes for following resistance values:

   (i) 47 Ω

   (ii) 56 kΩ

   (iii) 22 MΩ

   (iv) 39·6 MΩ 2,1,2

   (b) Suggest the correct method to measure capacitance of an electrolytic capacitor. What are the major precautions to be taken while reading capacitance of an electrolytic capacitor? 2,3

P. T. O.

2. (a) What is the role of a sensor or transducer in any measurement of physical quantity? Give two examples of these. Name important characteristics of sensor or transducer. 2,1,2

(b) Name four major static characteristics of an instrument. Define each of them with appropriate examples. 1,4

3. (a) Two voltmeters A and B give following observations in repeated measurements. Which of the two has more precession? Which of the two has more accuracy? Justify your answers with suitable reasoning.

| **Voltmeter A (V)** | 1·04 | 1·05 | 1·03 | 1·04 | 1·05 | 1·01 |
|---|---|---|---|---|---|---|
| **Voltmeter B (V)** | 1·038 | 1·085 | 1·002 | 1·132 | 1·087 | 1·965 |

1,1,3

(b) Differentiate between analog and digital multimeters. Which of the two will you prefer for testing a circuit of power supply? Give appropriate reasoning. 2,1,2

4. (a) Explain the working of Cathode Ray Oscilloscope (CRO) with the help of its block diagram. 5

(b) How is Digital Storage Oscilloscope (DSO) different from analog CRO? Write three major advantages of DSO. 2,3

5. (a) Explain the working principle of signal generator with the help of a block diagram. 5

(b) What is spectrum analyser? What are its major application areas? 2,3

6. (a) Give step by step procedure of measurement of inductance using LCQ meter. 5

(b) Show graphically variation of inductive and capacitive reactance with frequency of the signal. Define quality and dissipation factors in measurement of capacitance by Q meter . 3,2

7. (a) What do you understand by calibration of an electronic instrument? How is calibration of CRO done? 2,3

(b) What is open/short circuit compensation in measurement using electronic instrument? Suggest a suitable method for it. 2,3

[This question paper contains 2 printed pages.]

Your Roll No. .....

S.No. of Question Paper: 289-A (3) IC

Unique Paper Code : 42173923/32173923/32173902

Name of the Paper : Basic Analytical Chemistry (SEC)

Name of the Course : B.Sc. (H)/Program

Semester : V



Duration: 2 Hours

Maximum Marks: 38

(Write your roll no. on top immediately on receipt of this question paper)

**Attempt four questions in all.**

Q.1. a) Define *significant figures* with the help of an example.

b) Define hardness of water.

A 50.0 mL sample ofa river water is titrated against 0.0102 M EDTA solution. The end point was obtained at 29.9 mL of EDTA being consumed. Calculate the total hardness of water in *ppm* of $CaCO_3$.

c) Define *additive* and *proportional* errors.

**(2 ½ , 4, 3)**

Q.2. a) What do you understand by *BOD* and *COD* ?

Discuss in brief the water quality parameters need to be determined to decide the quality of water.

b) Define an *analyte* and *matrix*.

c) Give some applications of ion exchange chromatography.

**(5, 2, 2 ½ )**

Q.3. a) Outline the steps commonly employed in an analytical procedure. Briefly describe each step.

b) The result of an analysis is 38.95 mL compared with the accepted value of 39.24 mL. Calculate the absolute error and relative error (in parts per thousand).

P.T.O.

c) Define *molar extinction coefficient*. How is it related to concentration of an analyte? **(5, 2 ½ , 2)**

Q.4. **a)** Why is direct titration of $Ca^{2+}$ not feasible with EDTA if EBT is used as an indicator? How is sametitration possible in presence of small amount of $Mg^{2+}$ ?

**b)** Write short notes on:

i) Ion exchange Chromatography

ii) Water purification methods



**c)** Which buffer is used in $Mg^{2+}$ - EDTA titration using EBT as indicator? What is its pH range?

**(4, 4, 1 ½ )**

Q.5. **a)** Classify the following as determinate error or indeterminate error:

i) An unknown sample being weighed is hygroscopic.

ii) A colorimeter gives an absorbance reading of 0.03 in blank determination.

**b)** How does the extent of cross linking affect the efficiency of an ion exchanger ?

**c)** How will you determine the pH and alkalinity of a soil sample.Give experimental details.

**(4, 2, 3 ½ )**

28/11/18

This question paper contains 3 printed pages]

Roll No. | | | | | | | | | | | |

S. No. of Question Paper : 295 (4)

Unique Paper Code : 32173908 IC

Name of the Paper : Green Methods in Chemistry

Name of the Course : B.Sc. (Prog.) : SEC

Semester : V



Duration : **2 Hours** Maximum Marks : **38**

*(Write your Roll No. on the top immediately on receipt of this question paper.)*

Attempt *All* questions.

1. Answer the following :

   (*a*) Define sustainable development.

   (*b*) Catalytic reactions are preferred over ..... .

   (*c*) What is renewable feedstock ? Give an example.

   (*d*) Solar energy is an example of ..... source of energy.

   (*e*) How is atom economy different from yield ?

P.T.O.

(*f*) State relation between risk, hazards and exposure.

(*g*) What type of auxiliary substances are most commonly used in the chemical processes ?

(*h*) What is biocatalysis ? Give an example.

(*i*) What are greenhouse gases ?

(*j*) The twelve principals of green chemistry were given by ..... .

1, 1, 2, 1, 2, 1, 2, 2, 1, 1.

2. (*a*) What is an ionic liquid ? State the properties of ionic liquids that makes them alternative to traditional solvents.

(*b*) What is supercritical $CO_2$ ? What are advantages of using it over other reaction media ?

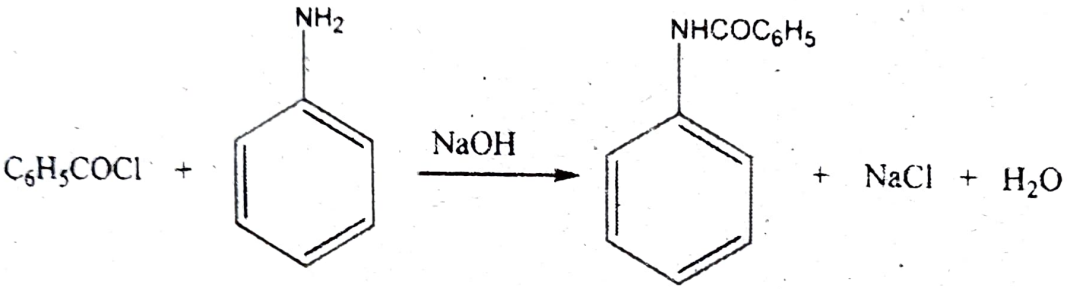
(*c*) How to prevent accidents in laboratory ? Explain. 3,3,2

3. (*a*) Define atom economy.

(*b*) How can you improve atom economy of a reaction ?

(*c*) Calculate atom economy of the following reaction :

(Atomic Weights : C = 12, O = 16, H = 1, N = 14, Cl = 35.5)




(*d*) Compare atom economy of addition/cycloaddition reactions over substitution reactions with example. 1,2,2,3

4. Give short on (any *two*) :

(*a*) Surfactants for carbon dioxide

(*b*) Right fit pigments

(*c*) Alternative sources of energy. 4,4

28/11/18

*This question paper contains 3 printed pages.*

5

*Your Roll No.* .....

*Sl. No. of Ques. Paper*: **307** **I**

*Unique Paper Code* : **32223904**

*Name of Paper* : **Basic Instrumentation Skills**

*Name of Course* : **B.Sc. (Prog.) Physics : SEC**

*Semester* : **V**

*Duration* : **3 hours**

*Maximum Marks* : **50**



*(Write your Roll No. on the top immediately on receipt of this question paper.)*

*Attempt five questions in all, including Q. No. 1 which is compulsory.*
*All questions carry equal marks.*

1. Attempt any *five* of the following:

   (a) Two resistors $R_1=36\Omega\pm5\%$ and $R_2=75\Omega\pm5\%$ are connected in series. Find the total resistance.

   (b) What is the function of delay line in CRO?

   (c) What is advantage of using digital instruments over analog instruments?

   (d) What is the significance of Lissajous pattern?

   (e) Write two advantages of DSO over CRO.

   (f) An ammeter of 0–25 A range has a guaranteed accuracy of 1% of full scale reading. The current measured is 5 A. What is the limiting error?

P. T.O.

(g) Why is the use of Maxwell's bridge limited to the measurement of medium Q coils (*i.e.*, $1<Q<10$)?

$5\times2=10$

2. (a) Explain what is precision and sensitivity of an instrument. 5

(b) For a digital multimeter explain the principles of measurement of dc voltage and dc current. 5

3. (a) What is the advantage of electronic voltmeter over conventional voltmeter? 5

(b) Draw a circuit diagram to show how a PMMC instrument can be used as an ac ammeter. Explain its' working. 5

4. (a) Draw the block diagram of basic CRO components. 5

(b) With the help of diagram, explain the front panel controls of a DSO/CRO. 5

5. (a) Explain signal generator with the help of block diagram. 5

(b) What is wave analyser? Explain it using an LC circuit. 5

6. (a) Explain the working principles of basic RLC bridge. 5

(b) What is Q-factor of a circuit? Explain it using a LR circuit. 5

7. (a) What is gating error and time base error in frequency counters? Explain. 5

(b) Explain the loading effect of a multimeter while measuring voltage across a low resistance and /or high resistance. 5

[This question paper contains 4 printed pages.]

(6)

Your Roll No. 2022.....

**Sr. No. of Question Paper : 1284** C

Unique Paper Code : 32173902/42173923

Name of the Paper : SEC- Basic Analytical Chemistry

Name of the Course : **B.Sc. (Hons.) / B. Sc. (Prog)**

Semester : III/V

Duration : 2 Hours Maximum Marks : 38



**Instructions for Candidates**

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **four** questions in all.
3. Question 1 is compulsory.

1. Attempt **any four** :

(a) Does precision always ensure accuracy? Explain.

(b) What are the primary and secondary nutrients present in soil?

P.T.O.

(c) Differentiate between adsorption and partition chromatography.

(d) What do you mean by hardness of water? How is it expressed?

(e) Enlist different reasons for pollution of water bodies. (2×4)

2. (a) What are complexometric titrations? Discuss different types of EDTA titrations with suitable examples.

(b) Explain the principle and procedure involved in ascending paper chromatography.

(c) Do as directed :

(i) Express in scientific notation: 555700

(ii) Give the correct number of significant figures: 0.0050830

(iii) Round off to three significant figures: 75.8437

(iv) Express the result in correct number of significant figures: 344.88×42.62/1110.524.

(3,3,4)

3. (a) What do you understand by the pH of soil? Explain how it is measured?

(b) Why water is first passed through cation-exchanger and then through anion- exchanger in the deionisation process.

(c) In two separate determinations, the concentration of iron in a given sample was found to be (a) 20.19 ppm and (b) 19.20 ppm. Taking the accepted value as 20.00 ppm, calculate the absolute error and relative error as per cent and as parts per thousand in the two determinations. (3,3,4)

4. (a) Define $R_f$ value. In a paper chromatographic separation, one of the amino acid components travelled a distance of 1.9 cm while the solvent travelled a distance of 5.1 cm. Calculate the Rf value. Give its units.

(b) Give the full form of the following **(Any Three)** :

(i) EBT (ii) TLC (iii) SHE (iv) BOD

(c) What do you understand by the term 'dissolved oxygen (DO)'? Describe a method to determine DO in a water sample. (3,3,4)

5. (a) What is precision? How is it expressed?

(b) What is pure water? Discuss the various purification techniques?

(c) Draw the layer structure of soil and discuss its various layers.

(3,3,4)

[This question paper contains 2 printed pages.]

(7) **Your Roll No.**2022.....

**Sr. No. of Question Paper : 1289** **C**

Unique Paper Code : 32173907/42173922

Name of the Paper : SEC: Analytical Clinical Biochemistry

Name of the Course : **B.Sc (H)/ B.Sc (Prog)**

Semester : III/V

Duration : 2 Hours Maximum Marks : 38



**Instructions for Candidates**

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **Four** questions from the five questions.

1. (a) Discuss the biological importance of Proteins.

   (b) What are lipoproteins? Discuss their types and functions.

   (c) Discuss in detail the factors affecting the enzyme activity. (3,3,3.5)

2. (a) Outline the pathway involved in alcoholic fermentation.

   (b) Explain replication of DNA.

P.T.O.

(c) Discuss the biological importance of cholesterol. (3,3,3.5)

3. (a) What are omega-3 and omega-6 fatty acids?

(b) Explain the difference between transcription and translation.

(c) Explain the difference between the lock and key model and Induced fit model in detail. (3,3,3.5)

4. (a) Discuss the composition and constituents of normal and pathological urine.

(b) Write the structures nitrogenous bases present in DNA.

(c) Explain the biochemical function of steroid hormones. (3,3,3.5)

5. (a) What is blood coagulation? Write the symptoms of anaemia.

(b) What are phosphoglycerides? Write its biological importance.

(c) What are three different kinds of RNA and their structures. (3,3,3.5)

[This question paper contains 4 printed pages.]

(8) **Your Roll No.** 2022.....

**Sr. No. of Question Paper : 1353** **C**

Unique Paper Code : 32223904

Name of the Paper : Basic Instrumentation Skills

Name of the Course : **B.Sc Prog CBCS_SEC (Prog / Hons)**

Semester : V/III

Duration : 3 Hours Maximum Marks : 50



**Instructions for Candidates**

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **five** questions in all. **All** questions carry equal marks.
3. Use of non-programmable scientific calculator is permitted.

1. (a) Describe the static characteristics of an instrument. Explain the difference between accuracy and precision of a measurement with an example.

P.T.O.

(b) What is limiting error? A voltmeter reads 70 V on its 100 V range and an ammeter reads 80 mA on its 150 mA range are used to determine the power dissipated in a resistor. Both these instruments are guaranteed to be accurate within ±1.5% at full scale deflection. Determine the limiting error of the power. (5,5)

2. (a) Explain the principle of voltage measurement of an ac millivoltmeter with block diagram. A basic D'Arsonval movement with a full-scale deflection of 200 μA and internal resistance of 100 Ω is used as a voltmeter. Determine the value of the multiplier resistance needed to measure a voltage of range 0-50 V.

(b) Explain the operation of full wave rectifier type AC voltmeter with a suitable diagram. (5,5)

3. (a) Draw the block diagram of a Cathode Ray Oscilloscope (CRO) and explain the functions of each block.

(b) Distinguish between dual beam and dual trace CRO. (5,5)

4. (a) Explain the operation of Schering bridge to determine the unknown Capacitance and also derive the relevant balancing equations.

(b) A Wein bridge at balance has the following components given as: R1 = R2 = 820 Ω, C1 = 0.2 μF, C2 = 0.4 μF, and R3 = 1.5 k Ω. Determine the frequency of the bridge. (5,5)

5. (a) Describe the working of a Q-meter for measurement of high impedance value.

(b) What is distortion factor meter. Explain its working. (5,5)

6. (a) Draw the block diagram of a pulse generator and explain its operation.

(b) What is a universal counter? How can it be used to measure the frequency, time and period. (5,5)

7. Write short notes on the followings : (5,5)

(a) Digital storage Oscilloscope

(b) Digital multimeter

[This question paper contains 2 printed pages.]

(9) **Your Roll No.** 2022.....

**Sr. No. of Question Paper : 1458** **C**

Unique Paper Code : 32173907 / 42173922

Name of the Paper : SEC: Analytical Clinical Biochemistry

Name of the Course : **B.Sc (H) / B.Sc (Prog)**

Semester : III / V

Duration : 2 Hours Maximum Marks : 38

**Instructions for Candidates**

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **four** questions from the **five** Questions.



1. (a) Discuss the biological importance of carbohydrates.

   (b) Write the structures of sugar present in DNA and RNA

   (c) What are cofactors and coenzymes? (3,3,3.5)

2. (a) Discuss the mechanism of enzyme action and the factors which affect the enzyme activity.

   (b) Explain the Krebs cycle briefly.

P.T.O.

(c) Write the composition and functions of blood. (3,3,3.5)

3. (a) Describe the binding role of –OH and $-NH_2$ groups in structure activity relationship.

(b) Explain the Watson Crick model of DNA in detail.

(c) What are the triglycerides? Discuss the biological importance of triglycerides. (3,3,3.5)

4. (a) Write the structure of ATP. Why ATP is called universal currency of cellular energy?

(b) Write the structures nitrogenous bases present in RNA.

(c) Explain the biochemical function of peptides hormones. (3,3,3.5)

5. (a) Discuss the importance of biocatalysis in green chemistry.

(b) Define transcription and translation.

(c) What are Liposomes? Discuss its biological Importance. (3,3,3.5)

[This question paper contains 4 printed pages.]

(10) Your Roll No. 2022.....

**Sr. No. of Question Paper : 1459**

Unique Paper Code : 32173902 /42173923

Name of the Paper : SEC : Basic Analytical Chemistry

Name of the Course : **B.Sc.(Hons.)/B.Sc. (Prog.)**

Semester : III/V

Duration : 2 Hours Maximum Marks : 38



**Instructions for Candidates**

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **four** questions in all.
3. Question no. **1** is compulsory.
4. The questions should be numbered in accordance to the number in the question paper.
5. Use of non - programmable scientific calculators and log tables are allowed.

P.T.O.

1. Attempt any **four** :

(a) A sodium phosphate solution is passed through a column of an anion exchanger in the chloride form. The $PO_4^{3-}$ ions are taken up by the ion exchanger. Write down the ion exchange equilibria.

(b) Give the name and structure of the indicator employed in the $Mg^{2+}$ - EDTA titration.

(c) Express the result of the following calculation to the correct number of significant figures: 26.234 +143.4.

(d) Quote two examples on the interdisciplinary nature of analytical chemistry.

(e) What does a high and a low value of dissolved oxygen signify? (2×4)

2. (a) Outline the steps commonly employed in an analytical procedure. Briefly describe each step.

(b) Explain chelate effect.

(c) Give the answer of the following operation to the correct number of significant figures and indicate the key number :

$$\frac{42.68 \times 891}{132.6 \times 0.5247} =$$ (3,3,4)

3. (a) Discuss any three methods to minimize systematic errors.

(b) Differentiate between :

(i) Mean and Median

(ii) Absolute error and Relative error

(c) Give the principle behind thin layer chromatography. Explain briefly how a TLC plate is developed, run and the various components detected. (3,3,4)

4. (a) How will you control the pH of an acidic and a basic soil?

(b) Classify the following as additive / proportional error :

(i) Loss in weight of a crucible, in which the precipitate is ignited.

(ii) An impurity in standard solution.

(iii) Errors in weights.

(c) List the various sources responsible for water contamination. Discuss briefly. (3,3,4)

5. (a) Give one word :

(i) Errors which cannot be corrected.

(ii) Square of standard deviation.

(iii) A determination that is carried out with the sample being omitted; under exactly the same experimental conditions.

(b) Explain the term sampling. Give its importance in chemical analysis.

(c) The titre volumes of a particular titration carried out by three students A, B, and C are given below. Compare the accuracy and precision of the three students, if the true titre volume is 22.22 mL.

Titre volumes by Student A (in mL): 22.22, 22.24, 22.23, 22.21, 22.20

Titre volumes by Student B (in mL): 22.28, 22.27, 22.29, 22.28, 22.28

Titre volumes by Student C (in mL): 22.38, 22.12, 22.32, 22.30, 22.18. (3,3,4)

[This question paper contains 8 printed pages.]

11 **Your Roll No.**2022.....

**Sr. No. of Question Paper : 1473** **C**

Unique Paper Code : 42353504

Name of the Paper : SEC – Transportation and Network Flow Problems

Name of the Course : **B.Sc. (Math Sci) – II / B.Sc. (Phy Sci) – II**

Semester : V

Duration : 3 Hours Maximum Marks : 55



**Instructions for Candidates**

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. This question paper has **FOUR** questions in all.
3. **All** questions are compulsory.

1. Three electric power plants with capacities of 25, 40 and 30 million kWh supply electricity to three cities. The maximum demands at the three cities are

estimated at 30, 35 and 25 million kWh. The price per million kWh at the three cities is given in the table

**Table: Price / Million kWh**

| | | City 1 | City 2 | City 3 |
|---|---|---|---|---|
| Plant | 1 | $600 | $700 | $400 |
| | 2 | $320 | $300 | $350 |
| | 3 | $500 | $480 | $450 |

Formulate the problem as a transportation model.

(5)

2. Attempt any **five** parts from the following :

(i) Compare the initial basic feasible solution obtained by the Northwest-Corner method and Least-Cost Method for the following transportation problem :

(6)

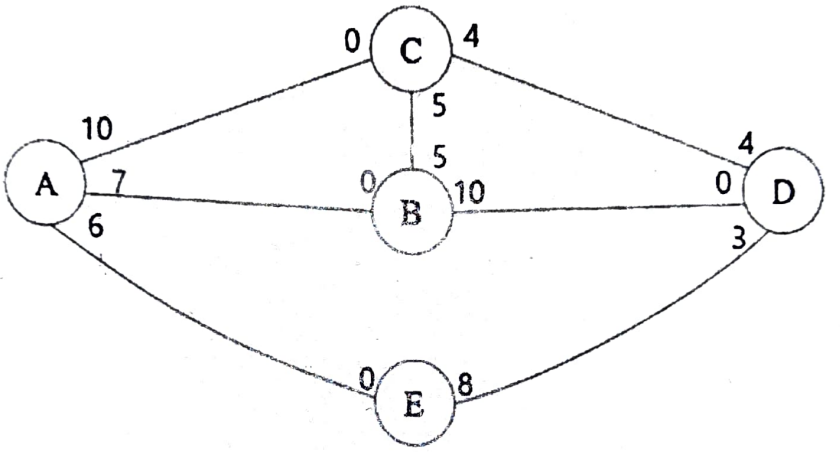
| | Destination | | | | Supply |
|---|---|---|---|---|---|
| Source | 1 | 2 | 3 | 4 | 6 |
| | 4 | 3 | 2 | 0 | 8 |
| | 0 | 2 | 2 | 1 | 10 |
| Demand | 4 | 6 | 8 | 6 | 24 |

(ii) In a company, five jobs J1, J2, J3, J4 and J5 are to be assigned to five machines M1, M2, M3, M4 and M5. The processing costs are as given in the following matrix. Find the allocation that will minimize the overall processing cost. (6)

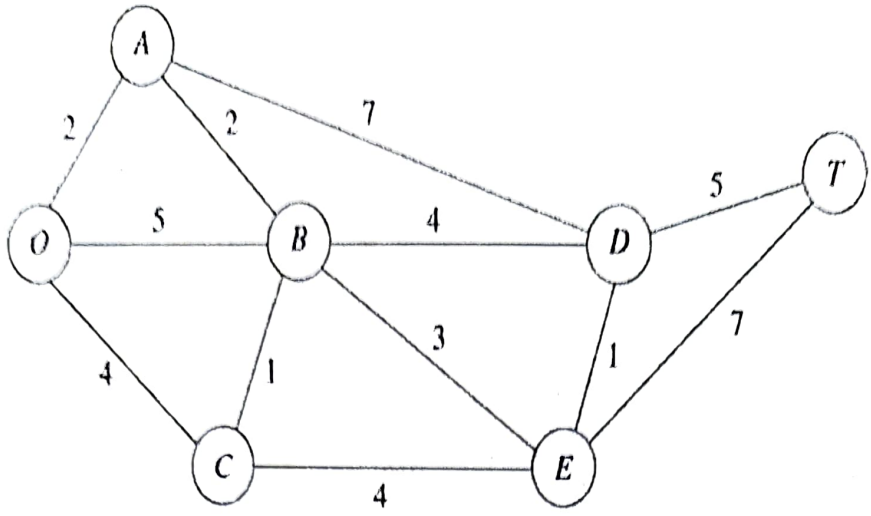
| Jobs \ Machines | M1 | M2 | M3 | M4 | M5 |
|---|---|---|---|---|---|
| J1 | 5 | 11 | 10 | 12 | 4 |
| J2 | 2 | 4 | 6 | 3 | 5 |
| J3 | 3 | 12 | 5 | 14 | 6 |
| J4 | 6 | 14 | 4 | 11 | 7 |
| J5 | 7 | 9 | 8 | 12 | 5 |

(iii) In the network shown below, find the flow pattern that gives the maximal flow from node A (source) to node D (sink) where the arc capacities are mentioned on respective arcs.

(6)




(iv) Midwest TV cable Company is in the process of providing cable service to new housing development areas. The below figure depicts possible TV linkages among the areas. The cable miles are shown on each arc. Determine the most economical cable network starting at node O. (6)




(v) Draw the NetWork defined by the sets

N = {1, 2, 3, 4, 5}:

A = {(1, 2), (1, 3), (2, 3), (2, 5), (3, 4), (3, 5), (4, 2), (4, 5)}

Also determine (a) a path (b) a cycle (c) a tree (d) a spanning tree. (6)

(vi) A project schedule has the following characteristics :

| Activity | Times (weeks) | Activity | Times (weeks) |
|---|---|---|---|
| A 1–2 | 4 | G 5–6 | 4 |
| B 1–3 | 1 | H 5–7 | 8 |
| C 2–4 | 1 | I 6–8 | 1 |
| D 3–4 | 1 | J 7–8 | 2 |
| E 3–5 | 6 | K 8–10 | 5 |
| F 4–9 | 5 | L 9–10 | 7 |

(a) Develop the associated network for the project.

(b) Determine the critical path and critical activities for the project. (2+4=6)

3. Three fertilizer factories X, Y, and Z located at different places of the country, produce 6, 4, and 5 lakh tones of urea respectively. Under the directive of the Central Government, they are to distributed to 3 states A, B, and C as 5, 3 and 7 lakh tones respectively. The transportation cost per ton in rupees is given below : (5+5=10)

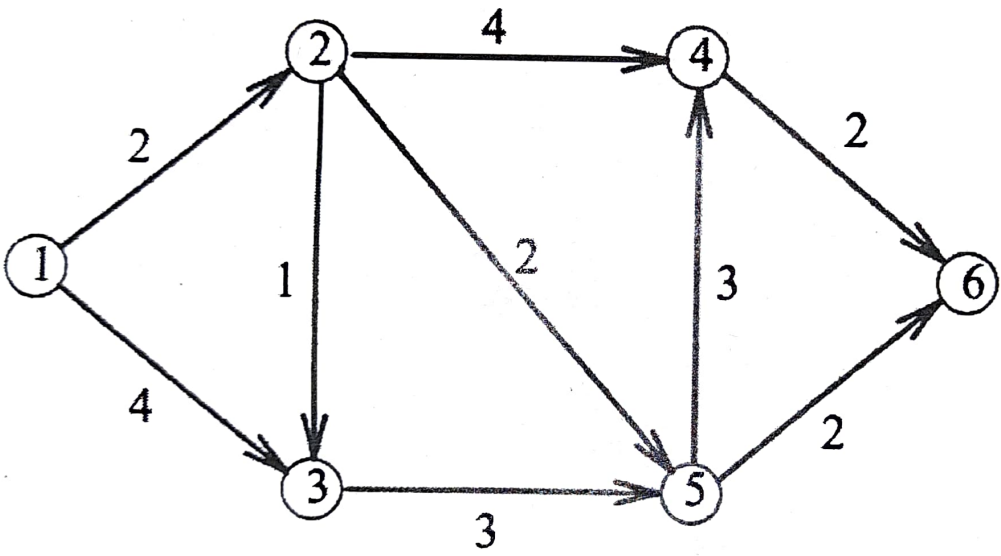
| | A | B | C |
|---|---|---|---|
| X | 11 | 17 | 16 |
| Y | 15 | 12 | 14 |
| Z | 20 | 12 | 15 |

(a) Use the Vogel Approximation method to find the initial basic feasible solution.

(b) Use the starting feasible solution (from above part) to find the optimal solution.

4. Attempt any **one** of the following : (10)

(i) Find the shortest route from node 1 to each other nodes using for the following network given below. Also, write down the route as well.




(ii) A salesman must travel from city to city to maintain his accounts. This week he has to leave his home base and visit each other city and return home. The table shows the distance (in kilometres) between the various cities. The home city is city A. Use the assignment

method to determine the tour that will minimize the total distance of visiting all cities and returning home.

| From Item | To Item | | | | |
|---|---|---|---|---|---|
| | *A* | *B* | *C* | *D* | *E* |
| *A* | - | 375 | 600 | 150 | 190 |
| *B* | *375* | - | 300 | 350 | 175 |
| *C* | *600* | 300 | - | 350 | 500 |
| *D* | *160* | 350 | 350 | - | 300 |
| *E* | *190* | 175 | 500 | 300 | - |

[This question paper contains 2 printed pages.]

(12) **Your Roll No.**2022.....

**Sr. No. of Question Paper : 1477** **C**

Unique Paper Code : 32223904

Name of the Paper : Basic Instrumentation Skills

Name of the Course : **B.Sc. Prog. CBCS – SEC**

Semester : V

Duration : 3 Hours Maximum Marks : 50

**Instructions for Candidates**

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **five** questions in all.
3. **All** questions carry equal marks.
4. Use of non-programmable scientific calculator is permitted.



1. (a) Explain the terms accuracy, sensitivity and resolution of an instrument.

   (b) Discuss loading effect of a voltmeter with an example. (5,5)

2. (a) Calculate the absolute error and percentage error of measurement if measured value of a resistor is equal to 20.65 Ω and its true value is 20.55 Ω.

P.T.O.

(b) What is the working principle of digital voltmeter? Write two advantages of digital voltmeter. (4,6)

3. (a) What is a CRT? How is CRO superior to ordinary measuring instruments?

(b) What is a sweep generator in CRO? Why it is used? (4,6)

4. (a) Draw the block diagram and explain the working principle of Digital storage Oscilloscope (DSO).

(b) Write three major advantages of DSO. (7,3)

5. (a) Describe the functioning of a standard signal generator.

(b) Explain the working of basic wave analyzer in detail. Write name of two types of wave analyzer. (5,5)

6. (a) Draw the block diagram of Q-meter and explain its working.

(b) Explain any ac bridge of your choice and find its balancing condition. (5,5)

7. (a) What is a multimeter? How it is used as an ammeter?

(b) How is the digital voltmeter different from analog voltmeter? (5,5)

[This question paper contains 4 printed pages.]

13 **Your Roll No.** 2022.....

**Sr. No. of Question Paper : 1682** **C**

Unique Paper Code : 32173910

Name of the Paper : SEC: Chemistry of Cosmetics & Perfumes

Name of the Course : **B.Sc. (Hons)/ B.Sc. (Prog)**

Semester : III/V

Duration : 2 Hours Maximum Marks : 38



**Instructions for Candidates**

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **two** questions in all.
3. **All** questions carry equal marks.

1. (a) Define cosmetics. How do you classify cosmetics on the basis of physical form.

   (b) Distinguish between Cold cream and Vanishing cream. List the ingredients used in their formulation.

P.T.O.

(c) Write short note on :

(i) shampoo and conditioner

(ii) deodorants and antiperspirant

(d) What are the ideal characteristics of Nail polish? Name the ingredients used in its remover.

(4,5,5,5)

2. (a) What are emollients? What is their function in various skin products?

(b) How do you classify hair dyes? Write the merits and demerits of use of dyes.

(c) Discuss the cosmetic properties and uses of Eucalyptus oil and Sandalwood oil.

(d) What are the essential characteristics of face powder? What is role of talc in talcum powder?

(4,5,5,5)

3. (a) Define SPF? What does SPF 30 signify? How sunscreens are effective in protection from harmful UV radiations?

(b) What are hair sprays? List the parameters considered for the designing of hair spray.

(c) What are oral hygiene products? Give the composition of a mouth wash.

(d) Discuss the role of preservatives in various cosmetics. (4,5,5,5)

4. (a) Discuss the structure of skin. Briefly describe the essential requirements for a skin care cosmetic product.

(b) Give a brief outline of method of preparation of lipstick.

Fill up the blanks with reference to lipsticks;

(i) Vegetable oil most commonly used _____

(ii) The shelf life of lipstick could be upto _____

(iii) Any one preservative used in lipstick _____

(c) How are shaving creams prepared? Mention the ingredients of a shaving cream.

(d) Give examples of cosmetics in the following categories;

(i) Curative

(ii) Protective

(iii) Decorative (4,5,5,5)