This question paper contains 2 printed pages.

Your Roll No. .....

Sl. No. of Ques. Paper: **6845** **IIC**

Unique Paper Code : **42343601**

Name of Paper : **Android Programming**

Name of Course : **B.Sc. (Prog.) Physical Science / Mathematical Science**

Semester : **VI**

Duration : **2 hours**

Maximum Marks : **25**

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

The paper has two Sections. All questions in Section A are compulsory. Attempt any three questions from Section B. All parts of a question must be attempted together.

SECTION A

1. (a) Explain the function of ***createchooser()*** method and ***onActivityResult()*** method. 1+1

   (b) Differentiate between ***wrap_content*** and ***match_parent*** values. 1

   (c) Name any two tags used to set the layout of the screen for an application. 1

   (d) Name the package used for connecting database with android application. 1

   (e) What is APK in android? 1

   (f) In which class is ***OnKey()*** method present? 1

P. T. O.

(g) How does an activity know about change in the states? 1

(h) Write one main use of ***androidmanifest.xml*** file. 1

(i) Name the method used to shut down the activity. 1

SECTION B

2. Briefly describe Android architecture using diagram. 5

3. What is SQLite Database? Write the code for inserting data into database by passing Content Values object. 2+3

4. Explain activity life cycle of Android. What is its duration for active lifetime? 2+3

5. Differentiate between Explicit and Implicit Intents. Write code for moving from one activity to another activity. 2+3

6. Describe the following:

(a) Static keyword (in Java)

(b) Spinner

(c) Abstract class (in Java). 1+2+2

(2) 2018

This question paper contains 8 printed pages]

Your Roll No. : .....

Sl. No. of Q. Paper : **8743** **HC**

Unique Paper Code : 42353604

Name of the Course : **B.Sc. Programme: Mathematics : SEC**

Name of the Paper : Transportation and Network Flow Problems

Semester : VI

Time : 3 Hours ***Maximum Marks : 55***

Instructions for Candidates :

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

(b) This question paper has **FOUR** questions in all.

(c) **All** questions are compulsory.

1. MG Auto has three plants in Los Angeles, Detroit, and New Orleans, and two major Distribution centers in Denver and Miami. The capacities of the three plants during the next quarter are 1000, 1500, and 1200 cars. The quarterly demands at the two distribution centers are 2300 and 1400 cars. The transportation cost per car on the different routes rounded to the closest dollar are given in the Table

P.T.O.

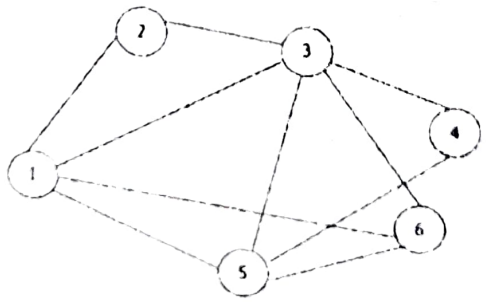
Table : Transportation Cost per Car

	Denver(1)	Miami(2)
Los Angeles (1)	$80	$215
Detroit(2)	$100	$108
New Orleans (3)	$102	$68

Formulate the Transportation Model. 5

2. Attempt any **FIVE** parts from the following

(i) For the network given below, determine
(a) a path (b) a cycle (c) a tree
(d) a spanning tree
(e) the sets N and A 6



(ii) Compare the initial basic feasible solutions obtained by the Northwest-Corner method AND Least-Cost method for the following transportation problem 3+3=6

		Destination			**Supply**
Source	1	2	3	4	**30**
	3	3	2	1	**50**
	4	2	5	9	**20**
Demand	**20**	**40**	**30**	**10**	

(iii) Five different machines can do any of the five required jobs and the associated cost matrix is as follows. Find out minimum cost possible through optimal assignment of machine to jobs. 6

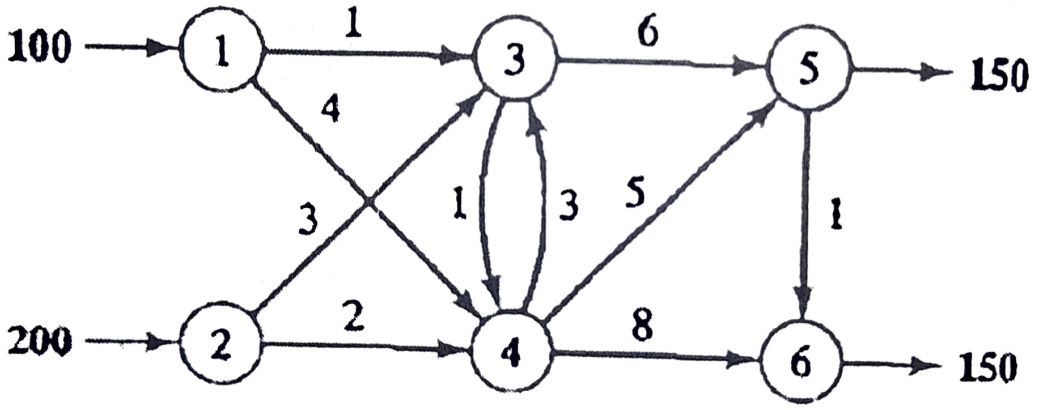
		Machine				
		1	2	3	4	5
Jobs	A	11	17	8	16	20
	B	9	7	12	6	15
	C	13	16	15	12	16
	D	21	24	17	28	26
	E	14	10	12	11	15

(iv) The network in the following figure gives the shipping routes from nodes 1 and 2 to nodes 5 and 6 by way of nodes 3 and 4. The unit shipping costs are shown on the respective arcs.

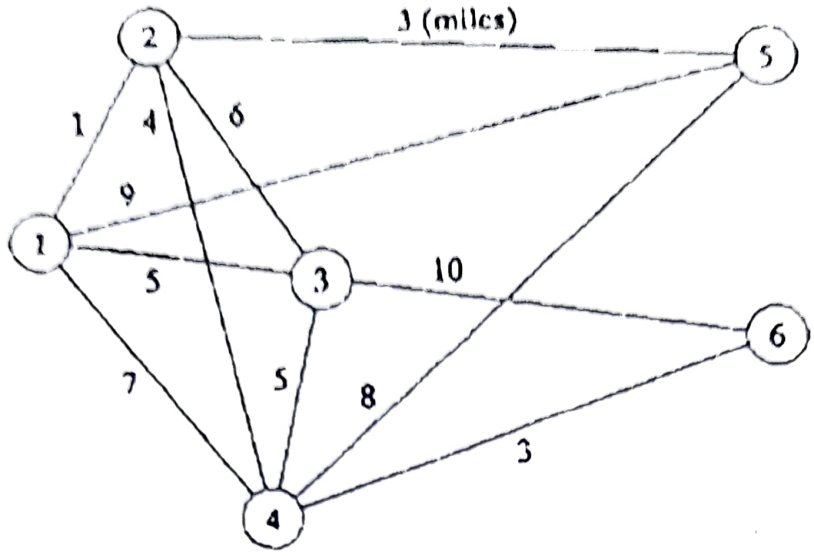
(a) Identify pure supply nodes, pure demand nodes, transshipment nodes and buffer amount.

(b) Only develop the corresponding transshipment model table.

2+4=6



(v) Midwest TV Cable Company is in the process of providing cable services to five new housing development areas. The adjoining figure depicts possible TV linkages among the five areas. The cable miles are shown on each arc. Determine the most economical cable network **starting at node 5.** 6



(vi) A publisher has a contract with an author to publish a textbook. The activities associated with the production of the textbook are given below. The author is required to submit to the publisher a hard copy and a computer file of the manuscript.

2+1+3=6

Activity	Predecessors	Duration (Week)
A: Manuscript proofreading by editor	---	3
B:Sample pages preparation	---	2

C: Book cover design	---	4
D: Artwork preparation	---	3
E: Author's approval of edited manuscript and sample pages	A,B	2
F: Book formatting	E	4
G: Author's review of formatted pages	F	2
H: Author's review of artwork	D	1
I: Production of printing plates	G,H	2
J: Book production and binding	C,I	4

(a) Develop the associated network for the project.

(b) Find the minimum time of completion of the project.

(c) Determine the critical path and critical activities for the project network.

3. Consider the transportation model in the given table

(a) Use the Vogel Approximation Method (VAM) to find a starting solution.

(b) Use this starting solution to find the optimal solution by the method of multipliers. 5+5=10

4.

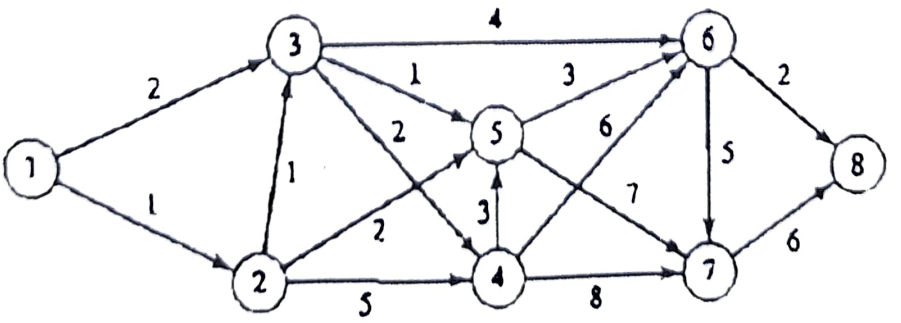
	X	Y	Z	**Supply**
A	1	2	6	**7**
B	0	4	2	**12**
C	3	1	5	**11**
Demand	**10**	**10**	**10**	

Attempt any **ONE** from the following

(i) The network in following figure gives the distances in miles between pairs of cities. Use Dijkstra's algorithm to find the shortest route between

(a) cities 1 and 8

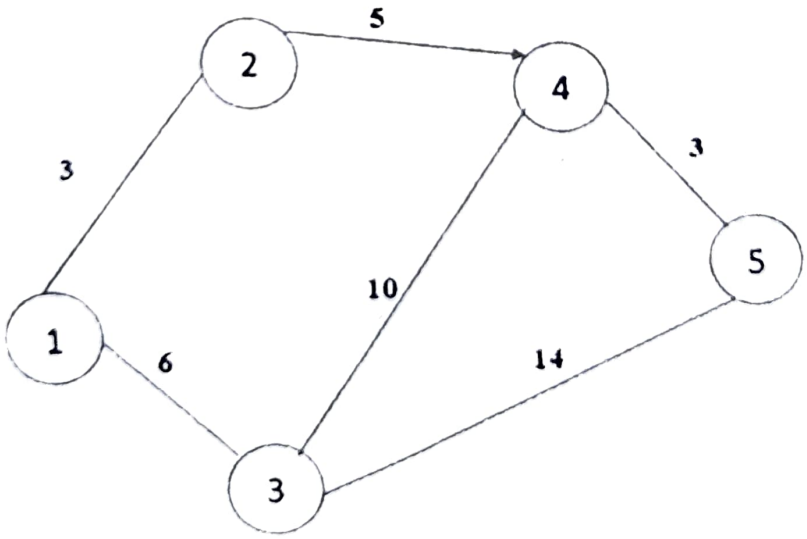
(b) cities 4 and 7 7+3=10



(ii) For the network given in the following figure, the distances (in miles) are given on the arcs. Arc (2, 4) is directional, so that no traffic is allowed from node 4 to node 2. List of all the other arcs allow two way traffic. Use Floyd's algorithm to determine the shortest route between

(a) node 5 to node 2
(b) node 1 to node 4
(c) node 2 to node 3
(d) node 3 to node 5
(e) node 1 to node 5

5×2=10



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

S. No. of Question Paper : **8748**

Unique Paper Code : **32223904** **HC**

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

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

Semester : **VI**

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.

Question No. **1** is compulsory.

1. Attempt any *five* of the following : 2×5

   (*a*) What is the difference between accuracy and precision ?

   (*b*) What is the sweep time in CRO ?

   (*c*) What is a time-base generator in CRO ?

   (*d*) Compare analog and digital instruments.

   (*e*) What is $3\frac{1}{2}$ digit display ?

P.T.O.

(*f*) What do you mean by calibration of an instrument ?

(*g*) What will be the percent resolution of a DVM if the number of full digits is 4 ?

2. (*a*) List *three* general class of errors and describe each one of them. 6

(*b*) Explain the principle of measurement of ac current in multimeter. 4

3. (*a*) What is the reason for using delay line in vertical deflection system of a CRO ? 4

(*b*) Explain the working of digital storage oscilloscope. 6

4. Discuss in detail how the measurement of frequency, frequency ratio and phase are done using CRO. 10

5. (*a*) What is an impedance bridge ? Explain the working of basic RLC bridge and mention its specifications. 7

(*b*) What are the different parameters that can be measured using a Q-metre ? 3

6. (*a*) Explain the working of digital multimeter with the help of a block diagram. 6

(*b*) Give a brief account of resolution and accuracy in a frequency-meter. 4

7. (*a*) What is signal generator ? Explain its working with the help of block diagram and give the specification of low frequency signal generator. 7

(*b*) What is Distortion factor meter ? 3

This question paper contains 3 printed pages]

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

S. No. of Question Paper : 8749

Unique Paper Code : 32223905 HC

Name of the Paper : Renewable Energy and Energy Harvesting

Name of the Course : B.Sc. (Prog.) Physics-Skill Enhancement Course

Semester : VI

Duration : 3 Hours Maximum Marks : 50

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

Question No. 1 is compulsory.

Attempt *five* questions in all.

Use of non-programmable scientific calculator is allowed.

1. Attempt any *four* of the following questions : 2.5×4=10

   (*a*) Write any *four* differences between renewable and non-renewable energy sources.

   (*b*) Explain briefly the Photovoltaic (PV) effect.

P.T.O.

(*c*) What is greenhouse effect ?

(*d*) Discuss various factors affecting the output power from wind energy.

(*e*) A solar cell receives solar radiation with photons of 1.8 eV energy having an intensity of 0.9 mW/cm^2. Measurements show open-circuit voltage of 0.6 V/cm^2, short-circuit current of 10 mA/cm^2 and the maximum current is 50% of the short-circuit current. The efficiency of cell is 25%. Calculate the maximum voltage that the cell can give and find the 'fill factor'.

(*f*) What do you mean by piezoelectric materials ? Give *two* examples.

2. With a neat sketch, mention the different basic components of a typical solar water heating system. Discuss in detail the working of forced circulation water heating systems. 2+3+5

3. Explain with the help of a diagram, the principle of closed cycle ocean thermal energy conversion (OTEC) system, with its advantages over open cycle OTEC. 5+5

4. Explain the importance of geothermal energy in the present day scenario. Explain in brief the working of different kinds of geothermal power plants. 5+5

5. Sketch the diagram of vertical axis wind turbine (VAWT) and explain the function of its main components. 5+5

6. Discuss in detail the functioning of a hydro electric power system. State the merits and limitations of hydro power systems. 5+5

7. Write short notes on any *four* :

   (*a*) Solar energy collectors

   (*b*) Carbon capture technology

   (*c*) Sources of bio-mass

   (*d*) Wave energy devices

   (*e*) Ocean biomass

   (*f*) Nuclear energy harvesting 2.5×4=10

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

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

S. No. of Question Paper : **2305** (5) 2019

Unique Paper Code : **42343601** **IC**

Name of the Paper : **Android Programming-SEC**

Name of the Course : **B.Sc. (P) (Physical Science/ Mathematical Science)**

Semester : **VI**

Duration : **2 Hours** Maximum Marks : **25**

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

Section A is compulsory.

Attempt any *three* questions from Section B.

Parts of a question must be answered together.

Section A

(Compulsory)

1. (*a*) Name the layout used in xml file for setting screen layout for handling vertical and horizontal scrolling. 1

(*b*) Name the android class used for starting new activity. 1

(*c*) Write down the usage of @ and + in **id** names while building Android application. 2

(*d*) Write *two* ways used for generating flexible layout that can adapt to different screen sizes. 2

(*e*) How does android control the execution of multiple applications on the device ? 2

(*f*) Write *one* use of the emulator.

Also write the command used for installing new application to the emulator or any connected device. 1+1

Section B

(Attempt any *three* questions)

2. Differentiate between Explicit and Implicit Intents. Draw a flow diagram showing handling of implicit intent by the Android system. 3+2

3. How does an activity know about change in the state of the application? Write down any *three* reasons for implementing callback methods for activities. 1+4

4. Make a simple android application to accept name of the person and his willingness to participate in a survey (Yes/No). Use appropriate user interface/controls required for designing the application. Write statements to set size, font colour and font type of the text. 5

5. Name the class used for handling database in Android application. Write the code for the following :

   (*a*) Create a table with any two attributes

   (*b*) Populate data into the table by passing Content Values object. 1+2+2

6. Describe the following :

   (*a*) Interface (in Java)

   (*b*) Option and Context Menu. 2+3

This question paper contains **8** printed pages]

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

(6) 2019

S. No. of Question Paper : **2306**

Unique Paper Code : **42353604** **IC**

Name of the Paper : **Transportation and Network Flow Problems**

Name of the Course : **B.Sc. Programme/B.Sc. Math. Sciences : SEC**

Semester : **VI**

Duration : **3 Hours** Maximum Marks : **55**

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

This question paper has *four* questions in all.

All questions are compulsory.

1. Hero Auto has three plants in *Gurugram, Haridwar*, and *Satyavedu*, and two major distribution centers in Delhi and Nagpur. The capacities of three plants during the next quarter are 500, 1000, and 700 cars and demands at the two distribution

centers are 1300 and 900 cars. The transportation costs per car on the different routes, rounded to the closest rupees, are given in the following table :

Table : Transportation Cost per Car

	Delhi (1)	Nagpur (2)
Gurugram (1)	Rs. 100	Rs. 235
Haridwar (2)	Rs. 120	Rs. 128
Satyavedu (3)	Rs. 122	Rs. 88

Formulate the Transportation Model. 5

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

(*i*) Compare the initial basic feasible solutions obtained by the Northwest-Corner method and Least-Cost method for the following transportation problem : 3+3=6

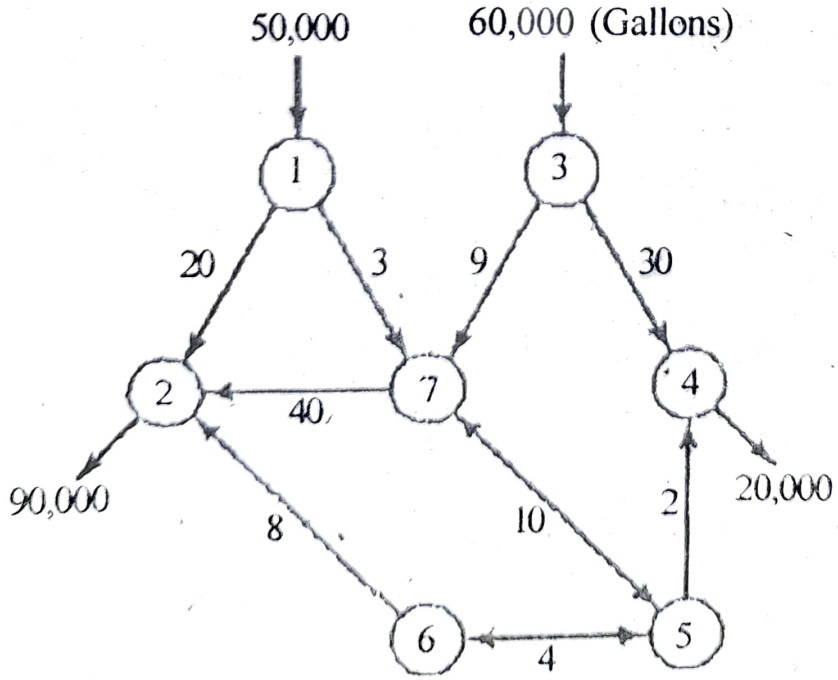
	Destination				**Supply**
Source	11	13	17	14	**250**
	16	18	14	10	**300**
	21	24	13	10	**400**
Demand	**200**	**225**	**275**	**250**	

(*ii*) Five men are available to do five different jobs. From past records, the time (in hours) that each man takes to do each job is known and given in the following table. Find the assignment of men to jobs that will minimize the total time taken. 6

Men

Jobs	1	2	3	4	5
A	3	8	2	10	3
B	8	7	2	9	7
C	6	4	2	7	5
D	8	4	2	3	5
E	9	10	6	9	10

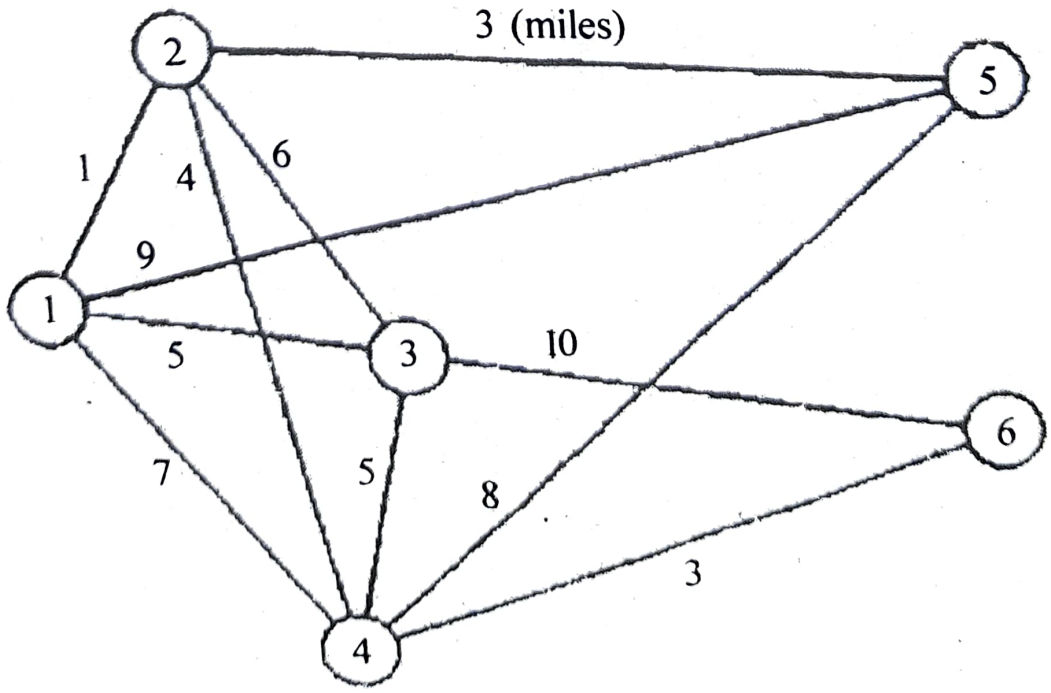
(*iii*) Consider the oil pipeline network shown in the following figure. The different nodes present pumping and receiving stations. Distances in miles between the stations are shown on the network :



(*a*) Identify pure supply nodes, pure demand nodes, transshipment nodes and buffer amount.

(*b*) Only develop the corresponding transshipment model table. 2+4=6

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



(*v*) Draw the Network defined by the sets N=1,2,3,4,5,6} :

A={(1,2),(2,3),(3,4),(4,5), (5,6),(1,5),(1,3),(1,6),(3,6),(3,5)}

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

(*vi*) The activities associated with a certain project are given below : 2+1+3=6

Activity	Predecessors	Duration (Week)
A	–	8
B	–	10
C	–	8
D	A	10
E	A	16
F	D, B	17
G	C	18
H	C	14
I	F, G	9

(*a*) Develop the associated network for the project.

(*b*) Find the minimum time of completion of the project.

(*c*) Determine the critical path and critical activities for the project network.

3. Consider the transportation model in the given table : 5+5=10

(*a*) Use the Vogel Approximation Method (VAM) to find a starting solution.

(*b*) Use this starting solution to find the optimal solution by the method of multipliers :

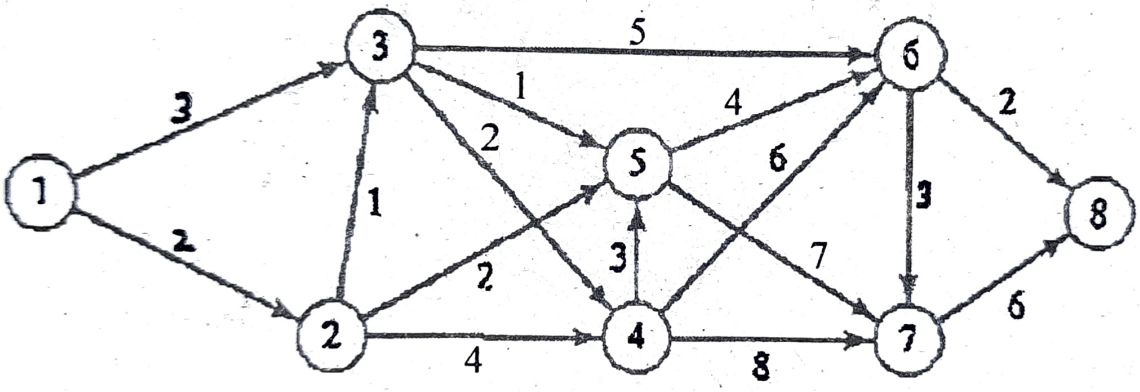
	X	Y	Z	Supply
A	5	1	8	**12**
B	2	4	0	**14**
C	3	6	7	**4**
Demand	**9**	**10**	**11**	

4. Attempt any *one* from the following :

(*i*) The network in the following figure gives the distances in miles between pairs of cities. Use Dijkstra's algorithm to find the shortest route between : 7+3=10

(*a*) cities 1 and 8

(*b*) cities 4 and 7.



(*ii*) For the network given in the following figure, the distances (in miles) are given on the arcs. Arc(3, 4) is directional, so that no traffic is allowed from node 4 to node 3. List of all the other arcs allow two way traffic. Use Floyd's algorithm to determine the shortest route between :

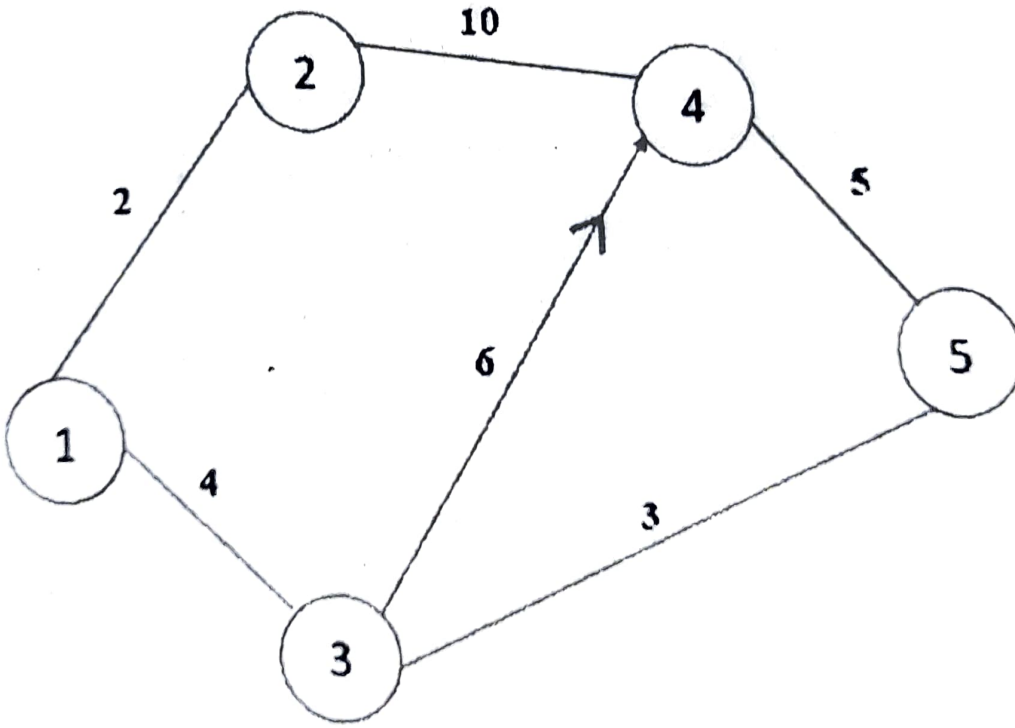
(*a*) node 5 to node 2

(*b*) node 1 to node 4

(c) node 2 to node 3

(d) node 3 to node 5

(e) node 1 to node 5 5×2=10



This question paper contains **4** printed pages]

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

S. No. of Question Paper : **2411** (7) 2019

Unique Paper Code : **42163601** **IC**

Name of the Paper : **Intellectual Property Rights (IPR)**

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

Semester : **VI**

Duration : **3 Hours** Maximum Marks : **75**

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

Attempt any *five* questions including

Question No. **1**, which is compulsory

Attempt *all* parts of a question together.

1. (A) Define the following (any *five*) : 5×1=5

(*a*) Trade secrets

(*b*) Industrial designs

(*c*) Copyrights

(*d*) Geographical indications

(*e*) Patents

(*f*) Trademarks.

P.T.O.

(B) State True *or* False (any *five*) : 5×1=5

(*a*) Patents are territorial rights.

(*b*) Registration of trademark does not render exclusive rights to the company to commercialize its products in the market.

(*c*) Makrana marble has a registered GI tag.

(*d*) Copyright is an unregistered right.

(*e*) A design can be registered under the Design Act (2000), only if it is new or original.

(*f*) A telephone directory is copyright protected.

(*g*) The criteria for patentability of an invention are novelty, inventive step and industrial applicability.

(C) Fill in the blanks with the appropriate names of protocols/ treaty or conventions (any *five*) : 5×1=5

(*a*) ..... is an international system for obtaining trade mark protection for a number of countries and/ or regions using a single application.

(*b*) ....., adopted in 1883, applies to industrial property in the widest sense, including patents, trademarks, industrial designs, utility models, service marks, trade names, geographical indications and the repression of unfair competition.

(*c*) ..... is for the protection of Literary and Artistic Works.

(*d*) ..... allows deposits of microorganisms at an international depository authority to be recognized for the purposes of patent procedure.

(*e*) ..... covers international trade in goods.

(*f*) ..... is an internationally recognized system, which allows the breeder to hold intellectual property rights in the propagation of a new variety for commercial use.

2. Write short notes on any *three* of the following : 3×5=15

(*a*) Plant Breeders' Right

(*b*) How are semi-conductor chips protected under IPR ?

(*c*) Why is it important to protect IP ?

(*d*) Procedure for obtaining patents in India.

3. Differentiate between the following : 5×3=15

(*a*) Service mark and Collective mark

(*b*) Copyright and Patent

(*c*) Infringement and Passing off

(*d*) Trademark and GI

(*e*) Discovery and Invention

4. (*a*) Explain Intellectual Property infringement issues. How are Indian laws involved in licensing and technology transfer ? 7.5

(*b*) Describe International Treaties and Conventions on Intellectual Property. 7.5

5. (*a*) Define Trade Secret. Give the legal aspects and risk involved in Trade Secret Protection. 7.5

(*b*) What is biopiracy ? Why is it important to protect Traditional Knowledge ? Explain the role of TKDL in protection of Traditional Knowledge. 7.5

6. (*a*) Describe basic and associated rights of patent. Comment on The Patent Act, 1970. 7.5

(*b*) Describe the features of Industrial Design. How to obtain registration of International Industrial Design ? 7.5

[This question paper contains 2 printed pages.]

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

2019

Sr. No. of Question Paper : 2427 **IC**

Unique Paper Code : 32173907 / 42173922

Name of the Paper : Analytical Clinical Biochemistry

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

Semester : VI

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 **three** questions in all.
3. Question No. **1** is compulsory.

1. (a) What are phospholipids? Explain its biological functions.

   (b) What is the fate of pyruvate during carbohydrate metabolism?

   (c) What are "high energy compounds"? Give examples.

   (d) Define the term allosteric inhibition.

   (e) Give two chemical tests to detect the presence of carbohydrates in a sample.

P.T.O.

(f) Write the sequence of the strand obtained from the given DNA strand during transcription:
5'-ACTCTTGATACG-3'

(g) What is an active site in an enzyme? What are its structural features? (2,2,2,2,2,2,2)

2. Differentiate between the following :

(a) DNA and RNA

(b) Normal urine and pathological urine

(c) Competitive and Non-competitive enzyme inhibition

(d) α-helix and β-pleated structure of proteins

(3,3,3,3)

3. (a) What are lipoproteins? Briefly discuss the role of cholesterol in our body.

(b) What are nucleotides? How are they different from nucleosides?

(c) Define the terms apoenzyme, holoenzyme and coenzyme.

(d) Describe the phenomena of denaturation of proteins.

(3,3,3,3)

4. Write short notes on the following **(any three)** :

(a) Tertiary structure of proteins

(b) Citric acid cycle

(c) DNA replication

(d) Liposomes

(4,4,4)

(9)

This question paper contains 3 printed pages]

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

2019

S. No. of Question Paper : **2429**

Unique Paper Code : **42173924** **IC**

Name of the Paper : **Instrumental Methods of Analysis**

Name of the Course : **B.Sc. (A.P.S.) Industrial Chemistry : SEC**

Semester : **VI**

Duration : **3 Hours** Maximum Marks : **38**

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

Attempt *three* questions in all.

Question No. **1** which is compulsory.

1. Attempt any *seven* questions :

(*a*) What are the limitations of Lambert-Beer's Law ?

(*b*) Which of the following are NMR active and why ?

^{12}C, ^{16}O, ^{14}N, ^{2}H, ^{19}F, ^{13}C, ^{31}P

(*c*) Arrange the following electromagnetic radiation in the increasing order of their energy : Radiofrequency, UV, Visible, Microwave and IR.

P.T.O.

(*d*) What are the common reference used in NMR spectroscopy ?

(*e*) What is chemical shift ?

(*f*) What is the effect of polar solvents in the shifts of absorption bands in UV-visible spectroscopy ?

(*g*) Which vector of electromagnetic radiation is responsible for the transition in NMR spectroscopy ?

(*h*) What are the common solvents used in NMR spectroscopy ?

(*i*) Give the name of reference used in IR spectroscopy of solids. 2×7

2. (*a*) In atomic emission spectroscopy why the energy of emission is lower than absorption ?

(*b*) Explain the various types of molecular vibrations associated with IR absorption.

(*c*) What are chemically equivalent and magnetically equivalent protons ? Explain with a suitable example. 3×4

3. (*a*) What is the requirement for molecule of IR active ? Explain by taking N_2, and HCI molecules as examples.

(*b*) Distinguish between Hypsochromic shift and Bathochromic shift in UV spectroscopy ?

(*c*) What is the necessary criteria for a compound to give NMR spectrum ? Illustrate your answer with two examples. 3×4

4. (*a*) Sketch the optical path of single beam instrument used in IR spectroscopy and precisely describe its function.

(*b*) How will you distinguish *o*-hydroxybenzaldehyde (salicylaldehyde) and *m*-hydroxybenzaldehyde on the basis of IR spectroscopy ?

(*c*) Differentiate between chromophore and auxochrome by taking suitable example. 3×4

5. Write short notes on any *three* of the following :

(*i*) Spin-spin relaxation

(*ii*) Vibration modes in IR

(*iii*) Spin-spin splitting.

(*iv*) Fingerprint region in Infra Red spectroscopy. 3×4

10

[This question paper contains 4 printed pages]

Your Roll No. : 2019

Sl. No. of Q. Paper : **2444** **IC**

Unique Paper Code : 32223903

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

Name of the Paper : Electrical Circuits and Network Skills

Semester : VI

Time : 3 Hours ***Maximum Marks : 50***

Instructions for Candidates :

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

(b) Attempt **five** questions in **all**.

(c) Question **NO.1** is compulsory.

(d) **All** questions carry equal marks.

1. Attempt any **five** : 2,2,2,2,2

(i) Explain Ohm's law with examples.

(ii) Discuss about different type of conductors.

P.T.O.

(iii) Draw the circuit diagram of a practical current source.

(iv) Discuss about the phase reversal.

(v) Draw the phasor diagram and waveform of voltage and current for a pure inductive circuit.

(vi) Explain about the overload devices.

(vii) The current through a 100 μF capacitor is given below. Find the sinusoidal expression for voltage across the capacitor.

$i = 40 \sin (500t + 60^{\circ})$

2. (a) Discuss in details about a digital multimeter. 5

(b) Explain in details about single phase and three phase ac sources. 5

3. (a) Describe the construction and working of a transformer. 5

(b) Describe the construction and working of an ac generator. Support your answer with relevant diagrams. 5

4. (a) State Thevenin's Theorem. 2

(b) Mention the steps to Thevenize an electrical circuit. 2

(c) In an electrical circuit with V_{th} as Thevenin equivalent voltage, R_{th} as Thevenin equivalent resistance, calculate the value of load resistance(R_L) to get the maximum power. Explain with circuit diagram. 2

(d) In case of electrical symbols, show the symbols for phase shifter (3-wire), bridge rectifier, dc current source, and zener diode. 4

5. (a) Discuss the basic design and working of a three phase motor with relevant diagram. 6

(b) Discuss the basic design and working of a dc motor with relevant diagram. 4

6. Describe the construction and working of half-wave and full-wave rectifiers in details. 4,6

7. Write short notes on any **two** of the following : 5,5

(i) Solid and Stranded Cables.

(ii) Cable Trays.

(iii) Extension board.

(iv) Losses across cables and conductors

(11)

[This question paper contains 4 printed pages]

Your Roll No. : 2019

Sl. No. of Q. Paper : **2446** **IC**

Unique Paper Code : 32223905

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

Name of the Paper : Renewable Energy and Energy Harvesting

Semester : VI

Time : 3 Hours ***Maximum Marks : 50***

Instructions for Candidates :

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

(b) Attempt any **five** questions. Question **NO. 1** is compulsory.

(c) **All** questions carry equal marks.

(d) Scientific calculators are allowed.

1. Attempt any **five** questions : 2×5

(a) A diesel engine generator consumes 2 liters of fuel per hour. Find the electrical energy generated by it in one day in KWh if its overall efficiency is 30%. Calorific value of diesel is 36.9 MJ/l.

P.T.O.

(b) A solar cell absorbs red light in the wavelength range 600 nm to 650 nm. What is its maximum output voltage ?

(c) A square meter on Earth's surface facing Sun receives 1000 W of solar insolation, which is 70% of the energy falling on the top of Earth's atmosphere. How much energy per second is released by the Sun. Assume average distance of the Sun from Earth is 1.49×10^{11}m .

(d) What is Carbon Capture Technology ?

(e) Give an example of uncontrolled nuclear reaction.

(f) Name three fossil fuels and explain why they are not renewable.

(g) List **four** differences between tidal and wave energy.

(h) What is the mass loss per hour in the production of 1000 MW of electricity in a nuclear power plant ?

2. What is solar pond ? What are the differences between convective and non-convective solar ponds ? Give **two** applications of solar pond. 10

3. Classify different types of solar thermal collectors and show the construction detail of flat plate collector. What are its main advantages. 10

4. What are the major applications of geothermal energy ? Discuss different environmental impacts of geothermal energy resources ? 10

5. Describe the working of different components of a wind energy harnessing system. What are major challenges in effective harvesting of wind energy ? 10

6. Discuss different methods of biochemical conversion. Explain the working of a biogas plant with proper diagram. 10

7. What is osmotic power ? What are its advantages and disadvantages ? How an osmotic power plant generates energy ? 10

(12)

[This question paper contains 4 printed pages.]

Your Roll No. 2022

Sr. No. of Question Paper : 1024 A

Unique Paper Code : 32173909

Name of the Paper : SEC – Pharmaceutical chemistry

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

Semester : IV / VI

Duration : 2.5 Hours Maximum Marks : 38

Instructions for Candidates

1. Write your Roll No., Name of the paper, Course, Semester, and Date of examination on the first page of answer sheet.
2. Attempt any **four** questions in all.

1. Answer the following : (3,3,3.5)

   (i) Describe drug modification and its role in modern drug development.

   (ii) Differentiate between drug and poison.

   (iii) Define Analgesics agents using suitable examples and describe their mode of action.

P.T.O.

2. Answer the following : (3,3,3.5)

(i) What are Anti-bacterial agents? Give an example along with its structure.

(ii) What do you understand by the terms Lead compound and Lead modification?

(iii) How is aerobic fermentation different from anaerobic fermentation? Explain with suitable example.

3. Answer the following : (3,3,3.5)

(i) Draw the structure of Penicillin and Ibuprofen.

(ii) What is a pharmaceutical aid? Explain with suitable examples.

(iii) How is paracetamol synthesized? Write the chemical reactions involved.

4. Answer the following : (3,3,3.5)

(i) What is pharmacophore? Discuss its role in pharmaceutical chemistry.

(ii) Match the following :

(i) Aspirin	(a) Antileprosy drug
(ii) Glyceryl trinitrate	(b) CNS agent
(iii) Diazepam	(c) Tuberculosis
(iv) Streptomycin	(d) Scurvy
(v) Dapsone	(e) Cardiovascular agent
(vi) Vitamin C	(f) 2-Acetoxybenzoic acid

(iii) Explain the synthesis of citric acid using fermentation process.

5. (a) Differentiate the following **(Attempt any two)** (3,3,3.5)

(i) Antibiotic and Antiallergic agent

(ii) CNS and Cardiovascular agents

(iii) Potency and Efficacy

(b) Define Antifungal agents and discuss their mode of action.

6. (a) Write short note on any **three** : (3,3,3,0.5)

(i) Bioisosterism

(ii) Side effect of Acyclovir

(iii) Sulphadrugs

(iv) Antiviral agent

(b) Write the structure of Chloromycetin.

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[This question paper contains 4 printed pages.]

12/05/2022 **Your Roll No.** 2022

Sr. No. of Question Paper : 1405 **A**

Unique Paper Code : 42163601

Name of the Paper : Intellectual Property Rights

Name of the Course : **B.Sc. Life Science (Skill Enhancement Course)**

Semester : VI

Duration : 3.5 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 **five** questions in all. Question No. **1** is compulsory.
3. **All** question carry equal marks.

1. (a) Define the following **(any five)** : (1×5=5)

   (a) Intellectual Property

   (b) Industrial Design

P.T.O.

(c) Geographical Indications

(d) Benefit sharing

(e) Biopiracy

(f) Infringement

(g) Semi-conductor chips

(b) Match the following : (0.5×6=3)

a. Madrid Protocol	i) Literary & Artistic work
b. Hague Agreement	ii) Specific origin
c. Berne Convention	iii) Industrial Designs
d. Software	iv) Trademark
e. Paris Convention	v) Industrial Property
f. Geographic Indication	vi) Patent

2. Write short notes on ***any five*** of the following : (3×5=15)

(a) NDUS criteria of a new plant variety

(b) Software protection in India

(c) Protection of Traditional Knowledge in the International Arena

(d) Paris Convention and Berne Convention

(e) Remedies available for Design Infringement

(f) Product patent and Process patent

(g) Domain Name Protection

3. Attempt **any two** : (7.5×2=15)

(a) What is a Copyright? Briefly explain the process of obtaining Copyright. How Copyright is transferred in India?

(b) Discuss the Patent Act 1970, and its three major amendments. What constitutes a patent infringement?

(c) What is a Trademark? Explain the different types of trademarks with examples. What is the process of registering a trademark?

(d) Describe the PPVFR Act, 2001 in detail. How this act is protecting 'breeders', 'farmers' and 'researchers' right?

(14)

[This question paper contains 4 printed pages.]

Your Roll No.....

12/5/22

Sr. No. of Question Paper : 1423 **A**

Unique Paper Code : 42173924

Name of the Paper : SEC- Instrumental Methods of Analysis

Name of the Course : **BSc (Prog)**

Semester : IV/VI

Duration :2.5 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 4** questions.

3. **All** questions carry equal marks.

4. Answers should be numbered in accordance with the number in the question paper

P.T.O.

1. (a) What is the fingerprint region in IR spectroscopy? Why is it important?

(b) Describe the two modes of fundamental vibrations in IR spectroscopy.

(c) Explain the effect of polar solvents in UV spectroscopy. (3.5, 3, 3)

2. (a) What is the principle of UV-Visible spectroscopy? Distinguish between red shift and blue shift in UV spectroscopy.

(b) Name the solvent used as an internal standard in NMR spectroscopy and why?

(c) Draw a neat schematic diagram of IR spectrophotometer. (3.5, 3, 3)

3. (a) Define chemical shift. What causes chemical shift in NMR spectroscopy?

(b) Describe the various electronic transitions involved in UV-Visible spectroscopy.

(c) Predict the number of signals with relative intensities in the low-resolution NMR spectrum of $CH_3CH_2CH_2OH$. (3.5,3,3)

4. (a) Why do nuclei such as ^{12}C and ^{16}O do not show NMR spectra? Give the factors which affect the chemical shift, δ.

(b) What is sensitivity and detection limit in AAS?

(c) Name the four components present in AAS instrument. (3.5, 3, 3)

(a) Write the principle of AAS? Give one important application of AAS.

(b) Discuss the significance of chromophore and auxochromes in UV spectroscopy giving suitable examples?

(c) What are the merits and demerits of AAS by flame and graphite furnace AAS? (3.5,3,3)

6. (a) What is the functional group region in IR spectra? Give the two factors which affect the frequency of a stretching vibration of IR spectrum.

(b) Write the two important applications of ^1H NMR spectroscopy?

(c) Calculate the probable λ_{max} value for the following molecule

$CH_2=CH(CH_3)-CH=CH_2$. (3.5, 3, 3)

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[This question paper contains 4 printed pages.]

Your Roll No. 2022...

Sr. No. of Question Paper : 1428 **A**

Unique Paper Code : 32173908

Name of the Paper : SEC – Green Method in Chemistry

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

Semester : IV / VI

Duration : 2.5 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 **Six** Questions.

1. (i) The first listed of the 12 Principles of Green Chemistry is ?

   (a) Prevent waste

   (b) Catalysis

   (c) Atom economy

   (d) Benign solvent

P.T.O.

(ii) Dr. Paul Anastas & Dr. John Warner created 10 Principles of Green Chemistry to reduce or eliminate the use and generation of hazardous substances?

(a) True

(b) False

(iii) Which one of the following three terms is used in the 'sustainability triangle'?

(a) Micro-economics

(b) Planet

(c) Social responsibility

(iv) Green chemists reduce risk by?

(a) Reducing the hazard inherent in a chemical product or process

(b) Minimizing the use of all chemicals

(c) Inventing technologies that will clean up toxic sites

(d) Developing recycled products

(v) _____, or VOCs, have been replaced and were banned in some paints.

(vi) Benzene, a _____ substance, is an important industrial solvent used in the production of pharmaceuticals, plastics, and dyes. (6×1)

(vii) What are biocatalysts? What are the advantages of bio-catalytic conversions? Give one example of the reaction. (3.5)

2. Write short notes (any **three**) :

(a) Green Chemistry in Sustainable development

(b) Green chemistry in pharmaceutical industry

(c) Solvent free reactions (3,3,3.5)

3. Give the Green Synthesis of following compounds :

(i) Disodium iminodiacetate

(ii) Furfural

(iii) Acetaldehyde (3,3,3.5)

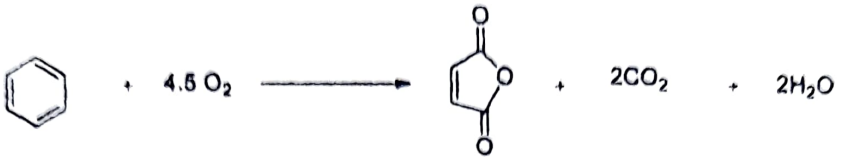
4. (a) (i) What are the goals of green chemistry?

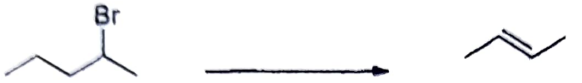
(ii) How % yield is different from atom economy. Discuss any one reaction where % yield is 100% but not the atom economy.

P.T.O.

(b) Calculate the atom economy of the following reactions :

(Mol mass: C=12, H=1, O=16, Br=80)

(i) 

(ii) 

(4,5.5)

5. (a) Discuss the following microwave assisted reactions :

(i) Decarboxylation in organic solvents.

(ii) Oxidation of toluene benzamide in water.

(b) hat are immobilized solvents? Explain giving one example. (5,4.5)

6. (i) Explain what is meant by the term phase transfer catalyst and give one example of such a catalyst.

(ii) Compare heterogeneous and homogeneous catalysis in terms of green chemistry.

(iii) Write a note on green chemistry and catalysis in terms of biocatalysis, asymmetric catalysis and photocatalysis. (3,3,3.5)

(16)

[This question paper contains 6 printed pages.]

Your Roll No. 12105122

Sr. No. of Question Paper : 1434 **A**

Unique Paper Code : 42343602

Name of the Paper : PHP Programming (SEC)

Name of the Course : **B.Sc. Program / B.Sc. Mathematical Science**

(Admission Year 2019)

Semester : VI

Duration : 2 Hours Maximum Marks : 25

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Question no. **1** is compulsory.
3. Attempt any **3** questions from Question no. **2** to **7**.

1. (a) Name the softwares required to create a PHP based web application. (2)

P.T.O.

(b) Consider the value of $x = 12, $y = 4, $z = 4 and $a = 2. What will be the value of $a for each of the following? (Show step by step execution of each statement)

(i) $a = $z / $y * $x / $y;

(ii) $a += $x + $y; (2)

(c) Define the terms 'class' and 'inheritance' w.r.t. PHP objects. (2)

(d) Write a PHP code segment to find a string into another string using two variants (i) case sensitive (ii) case insensitive (4)

2. Write the output of the following PHP code segment : (5)

```
<?php

$str = 'one,two,three,four';

print_r(explode(',',$str,1));

print "<br>";

$cars = array('1','23',101,33, 'ZZ', 'aa');
```

```
sort($cars, SORT_NUMERIC);

echo "<br>";

$a = "Original";

$my_array = array("a" => "Cat", "b" => "Dog", "c" =>
    "Horse");

extract($my_array);

echo "$a = $a; $b = $b; $c = $c";

echo "<br>";

$str = addslashes('What docs "yolo" mean?');

echo($str);

echo "<br>";

echo strcmp("Hello","hELLo");

echo "<br>";

?>
```


3. (a) Explain the difference between INCLUDE and REQUIRE directives in PHP. (2)

(b) Write a PHP program that would print the information (name, year of joining, salary, address) of an employee by creating a class named 'Employee'. The output should be as follows :

Name	Year of joining	Address
Robert	1994	64C-WallsStreet

(3)

4. Whatis the difference between "=" and "=>" operators in PHP? Write a PHP code segment to perform the following :

(i) Assign 5 elements to numeric array and associative array.

(ii) Display the elements stored in part(i) using foreach....as looping statement. (5)

5. What is a regular expression? Write a PHP code segment to explain the usage of the following regular expressions :

(i) /[a-zA-ZO-9]*/

(ii) /(very)*good/

(iii) /bob$/ (5)

6. Create an HTML FORM to read ROLLNO, NAME and MARKS in 5 subjects from the user. Write a PHP code to compute the PERCENTAGE and GRADE using user defined functions. The criteria for assigning GRADE is as follows : (5)

PERCENTAGE	GRADE
>=80	A
>=60 and <80	B
>=40 and <60	C
<40	FAIL

7. Write the PHP code segment for the following (making your own assumptions for database name, table name, username and password) :

(i) Connect to MYSQL from PHP (Connecting to database server) (1)

(ii) Create a table containing EMPLOYEE ID and EMPLOYEE NAME (1)

(iii) Insert 2 records in the table created in part(ii) (1)

(iv) Fetch all the records from the table and display them in the tabular form. (2)

(17)

[This question paper contains 6 printed pages.]

Your Roll No. 2022

Sr. No. of Question Paper : 1435 **A**

Unique Paper Code : 42353605

Name of the Paper : SEC-4: Statistical Software-R

Name of the Course : **B.Sc. Mathematical Sc. / B.Sc. (Prog.)-CBCS (LOCF)**

Semester : VI

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 all **5** questions, selecting any **2** parts from each.
3. All commands should be written using language R.

1. Total marks : 2×2=4

Attempt any **two** of the following :

(a) Give R command for data using scale 2, write number from the data, when the stem and leaf chart has a stem of 2 and a leaf of 3 with the

P.T.O.

message :

The decimal point is 1 digit(s) to the left of the |

(b) Give R command to find $\sin(/n\pi/3)$ for n = –2, –1, 0, 1, 2.

(c) Give R command to find the running mean of the data: 5 7 5 3 2 6 8 5 6 9 4 5 7 3 .

(d) Give R command to find mean of the list items 'data.list' with output as a matrix.

2. Total marks: 3×2=6

(a) Using R command convert the following data into integers :

m = (8.8, 9.2, 9.3, 4.1, 8.7, 7.0, 3.7, 2.0, 5.4)

Also give R command to find order, rank and decreasing order of 'm'.

(b) Write the R commands to enter the characters: May, Mark, Nest, Nestle using the scan() command to get output x : "May", "Mark", "Nest", "Nestle". Also give R commands for objects in x having the word 'est'.

(c) (i) What is the use of fivenum() command in R.

(ii) What is the meaning of R command: > apply(data, 1, median, na.rm = TRUE)

(d) Give difference between seq( ) and seq _along() commands in R. Illustrate with example.

3. Total marks : 4×2=8

Giving R command for the following matrix A

	Thistle	Vipers	Blackberry
Garden.bee	8	3	4
Red.tail	18	9	2
Honey.bee	12	13	10
Carder.bee	8	6	32

Write R commands for any **two** of the following :

(a) Convert the matrix A into a data frame and display the data for Blackberry only.

(b) Finding the sum of the rows of the matrix A and the mean of the column 'Vipers'.

(c) Finding the sum of the columns of the matrix A and the mean of the row 'Red.tail'.

(d) Re-order the columns of the matrix A so that the top row (Garden.bee) is in decreasing abundance from left to right.

4. Total marks : 5×2=10

Give R commands for any **two** of the following :

(a) R commands to produce a histogram for a random sample of 20 numbers between 10 and 50, and also overlay a density plot of blue color having line width 2 units with gaussian kernel.

(b) Giving R command to make a data frame 'aris' of two-column with a response variab e (leaf-length) and a predictor variable (species):

leaf-length	9.2	7.3	1	8	2.4	5.1	4	7	6.5	7	3.2	4	5	3	5	6	4	6
species	A	A	B	A	B	C	B	B	B	C	B	B	B	C	B	C	B	A

Produce a histogram and also overlay a density plot of green color having line width 2 units with gaussian kernel for the species 'B' only.

(c) Shapiro-Wilk normality test and normal quantile-quantile plot with a straight line for the species 'B' only from the above data frame 'aris'. Also

using apply family command to produce Shapiro-Wilk normality test for the species 'A', 'B' and 'C' respectively from the above data frame 'aris'.

(d) Create a PDF of size 5x4 inches to draw a box-whisker plot of the above data frame 'aris' using light blue color.

5. Total marks : 5×2=10

(a) Using R command create the following table 'Score'

	English	Sociology	Geography	Economics
RAJ	81	81	96	92
RIYA	94	98	78	83
JOHN	92	79	82	92
ATHENS	90	85	87	87

Create a box-whisker plot to compare the marks by students in all the four subjects. Also color it blue and add axis labels as 'Subjects' & 'Marks' respectively.

(b) Using R command represent the above data 'Score' graphically through bar cart. Also label the axis and color the bars.

P.T.O.

(c) Consider the marks of randomly selected 20 students in Mathematics as :

79 63 59 93 78 72 68 33 85 56 77 95
94 78 83 53 44 47 99 76

Write R commands for the above data into a variable 'M' using scan() and create a blue color line chart of 'M' with instruction of points with line segments between.

(d) R commands to create a pie chart giving title 'Chart-Expenditure' and name to each slice as Health, Education, Industries, Agriculture, Social Sector with 15%, 25%, 45%, 5%, and 10% expenditures respectively from the total expenditure of 1000 cr.

[This question paper contains 4 printed pages.]

Your Roll No. 2022

Sr. No. of Question Paper : 1471 **A**

Unique Paper Code : 32173902 / 42173923

Name of the Paper : SEC – Basic Analytical Chemistry

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

Semester : IV/VI

Duration : 2.5 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. **All** questions carry equal marks.

1. (a) Discuss various steps involved in quantitative analysis.

   (b) How many significant figures are there in the following numbers.

   (i) 0.03 (ii) 123.000 (iii) 8.0045

(c) A sample of an alloy contained 39 ± 0.02 % of copper. Two analysts reported the following measurements for copper content

First Analyst : 39.05%, 39.25%, 39.08%, 39.14%

Second Analyst: 39.40%, 39.44%, 39.41%, 39.43%

Comment on accuracy and precision of above two sets of data. (3,3,3.5)

2. (a) Differentiate between the following **(any two)**

(i) Sand and clay

(ii) Gross sample and Grab Sample

(iii) Adsorption chromatography and partition chromatography

(b) Describe five major components of soil. (6,3.5)

3. (a) What is chelon effect?

(b) Write name and structure of any one indicator used in EDTA titrations.

(c) Describe various human activities causing water pollution. (3,3,3.5)

4. (a) What are the sources of determinate errors and how can these be minimized?

(b) Explain how dissolved oxygen content of water can be determined?

(c) Write a short note on column chromatography. (3,3,3.5)

5. (a) Draw the structures of a strong cation exchange resin and a strong anion exchange resin.

(b) What do you understand by hardness of water? How is it expressed?

(c) Draw structure of EDTA. What are the advantages of using EDTA in complexometric titrations? (3,3,3.5)

6. (a) What is the significance of sampling in any analysis? What do you understand by homogeneous and heterogeneous samples?

(b) Explain the functioning of glass electrode in pH measurement.

(c) What are the causes of soil acidity? What measures can be taken to control the pH of acidic soil? (3,3,3.5)

[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 4570 **E**

Unique Paper Code : 32173902 (Hons.) / 42173923 (Prog.)

Name of the Paper : SEC – Basic Analytical Chemistry

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

Semester : IV / VI

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 out of **six**.
3. **All** questions cany equal marks.
4. Attempt all parts of a question together.
5. Use of non-programmable scientific calculator is allowed.

P.T.O.

1. (a) Give one word or phrase for the following : (3)

(i) Square of standard deviation

(ii) A solution prepared from all the reagents but no analyte

(iii) Substance added to exhibit a visual cue for completion of a reaction

(b) Define the following terms : (3)

(i) Eutrophication

(ii) Glass Electrode

(iii) Chelate

(c) Write the chemical equation involved in the interaction of nickel ions with spraying agent in the chromatographic separation. Why is it necessary to expose the chromatogram paper to the fumes of ammonia after spraying it with 1% alcoholic solution of DMG? (3.5)

2. (a) In a set of measurements, the following concentrations of iron in ppm were reported as :

20.2, 20.4, 20.3, 20.1, 19.9, 20.0, and 19.8.

Calculate :

(i) Standard deviation

(ii) Relative standard deviation. (3)

(b) Define R_f and give its full form. Enlist the advantages of thin layer chromatography over paper chromatography. (3)

(c) Discuss in brief the method involved in estimation of concentration of Fe^{+2} ions in a multivitamin tablet. Name the analytical technique used.

(3.5)

3. (a) Define complexometric titrations. Give the full form of a polydentate ligand commonly used in complexometric titrations. Why is the disodium salt of EDTA used instead of tetrasodium salt of EDTA in complexometric titrations?

(3)

(b) Differentiate between any **two** the following :

(i) Determinate and indeterminate errors

(ii) Biochemical oxygen demand and chemical oxygen demand

(iii) Homogenous and heterogeneous samples

(3)

(c) Give the full form of DO and explain its significance. Name the method and explain the principle involved in estimation of DO in a water sample. (3.5)

4. (a) When can zero be used as a significant figure? Indicate the number of significant figures in the following expressions :

(i) 1.0030

(ii) 0.03010

(iii) 0.0075020

(iv) 500 (3)

(b) Briefly explain the composition of soil. What are the factors which determine its fertility?

(3)

(c) Define hardness of a water sample. Name any two indicators used in its estimation and draw their structure. Why hardness of a water sample is expressed in terms of calcium carbonate and parts per million? (3.5)

5. (a) What is a buffer solution? What is its application in complexometric titrations involving EDTA solution? (3)

(b) What is the principle involved in ion exchange chromatography? Give one example each of cation and anion exchange resin. (3)

(c) A high degree of precision does not always imply high accuracy. Justify the statement. (3.5)

6. (a) Explain two instrumental techniques used in analytical process of determination of a sample. (3)

(b) What do you understand the term 'alkalinity of a water sample'? Name the ions which contribute to the alkalinity of a water sample. Which combination of ions cannot be estimated for alkalinity? (3)

(c) Define the term sampling. Explain its significance in chemical analysis? (3.5)

[This question paper contains 4 printed pages.]

20 **Your Roll No.....**

Sr. No. of Question Paper : 5600 **E**

Unique Paper Code : 42163601

Name of the Paper : Intellectual Property Rights

Name of the Course : **B.Sc. Life Science (Skill Enhancement Course)**

Semester : VI

Duration : 3 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 **five** questions in all. Question No. **1** is compulsory.
3. **All** question carry equal marks.

1. (a) Fill in the blanks **(any five)** : (1×5=5)

(i) Duration for trademark protection in India is _____ .

(ii) Head office for filing an application for registration of a design is at _____.

(iii) _____ and _____ are examples of GI handlooms in India.

(iv) Plagiarism is a type of _____ infringement.

(v) A _____ is an exclusive right granted for an invention.

(vi) World Intellectual Property Day is celebrated on _____.

(vii) Protection of Literary and Artistic Works was first established at the _____ Convention.

(viii) Protection of Plant Varieties in India is covered under _____ Act.

(b) Define the following (**any three**) : (1×3=3)

(i) Appellations of origin

(ii) Gene Bank

(iii) Domain Name

(iv) Trade secret

(v) Goodwill

(vi) Vienna Code

(vii) PPVFR

2. Differentiate between ***any three*** of the following : (5×3=15)

(a) Patent vs. Copyright

(b) Bio-piracy vs. Bio-prospecting

(c) Passing off vs. Infringement

(d) WIPO vs. WTO

(e) Trademark vs. Geographical Indications

3. Attempt any **two** : (7.5×2=15)

(a) Define Trademark. Discuss various types of trademarks with examples. Briefly describe the Defenses in cases of Passing off.

(b) What is TKDL? Why was it established? Discuss its structure and one example.

(c) What is meant by *Sui Generis* protection? What are the criteria for giving a GI tag? Explain with two examples.

(d) According to the Patent Act, what are Patentable and Non-patentable Inventions? Explain in brief the working of Patents. What are the objectives of patenting Biotechnology inventions? Explain with examples.

[This question paper contains 4 printed pages.]

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Your Roll No.....

Sr. No. of Question Paper : 5618

Unique Paper Code : 42173924

Name of the Paper : SEC- Instrumental Methods of Analysis

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

Semester : IV/VI

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 **4** questions. **All** questions carry equal marks.
3. Answers should be numbered in accordance with the number in the question paper.

1. (a) Explain with neat diagram the instrumentation of Infra - red spectrophotometer.

   (b) Write the structure of TMS. How many signals are shown by it in NMR spectrum?

(c) How UV spectroscopy is useful in distinguishing between conjugated and a nonconjugated diene? Explain with suitable example. (3.5,3,3)

2. (a) Differentiate between the following giving suitable examples (**Any 2**) :

(i) Hypsochromic and bathochromic shift

(ii) Beer's Law and Lambert's Law

(iii) Hot bands and Overtones

(iv) Finger print and Functional group region

(b) Predict the appearance of low-resolution NMR spectrum of ethanol. (3,3,3.5)

3. (a) What is chemical shift? The observed chemical shift of a proton is 300 Hz from TMS at 100 MHz instrument, calculate the chemical shift in δ.

(b) Discuss the effect of polar solvents on shift of absorption bands in UV-VIS spectroscopy. Give suitable example.

(c) Why trans stilbene absorbs at longer wavelength as compared to its cis isomer? (3.5,3,3)

4. (a) Define the following terms (**Any 3**) briefly. Illustrate your answer with suitable examples.

(i) Chromophore

(ii) Auxochrome

(iii) Monochromatic light

(iv) Frequency

(v) Upfield and downfield

(b) Giving any 4 reasons, explain why TMS is selected as standard reference compound in NMR spectroscopy. (2,2,2,3.5)

5. (a) Write short notes on the following (**Any 3**) :

(i) UV spectroscopy

(ii) IR spectroscopy

(iii) Atomic Absorption spectroscopy

(iv) Nuclear Magnetic Resonance spectroscopy

(b) Write any 2 uses of IR spectroscopy.

(2.5,2.5,2.5,2)

6. (a) Explain the NMR spectrum of the n-propanol with respect to :

(i) Types of hydrogens present

(ii) Number of signals this compound show

(b) What are the different criteria for choosing a suitable solvent in UV- Visible spectroscopy?

(c) What is the relation between wavelength and energy of electromagnetic radiation? Convert the wavenumber of 2500cm^{-1} to wavelength in A°.

(3,3,3.5)

22

[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 5623 E

Unique Paper Code : 32173908

Name of the Paper : Skill Enhancement Course: Green Methods in Chemistry

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

Semester : IV / VI

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 **three** questions in all.
3. Question 1 is compulsory and carries 14 marks.
4. All other questions carry 12 marks each.
5. Attempt all parts of a question together.

1. (a) Select the most appropriate option :–

(i) Which amongst the four industries is most waste generating? The E-factors have been specified.

(a) Oil refining	0.1
(b) Bulk Chemicals	<1-5
(c) Fine Chemicals	5-50
(d) Pharmaceuticals	25-100

(ii) Which of the following legislations gave birth to green chemistry initiatives?

(a) The Clean Water Act of 1972

(b) The Montreal Protocol of 1989

(c) The Pollution Prevention Act of 1990

(d) The Superfund Act of 1980

(iii) What is the U.S. Presidential Green Chemistry Challenge Award?

(a) An award related to recycling

(b) An award for industry only

(c) The only chemistry award given by the President

(d) Challenges companies to become fuel efficient

(iv) Which of the following are among the 12 Principles of Green Chemistry?

(a) Design commercially viable products

(b) Use only new solvents

(c) Use catalysts, not stoichiometric reagents

(d) Re-use waste

(v) The second listed of the 12 Principles of Green Chemistry is :

(a) Prevent waste

(b) Catalysis

(c) Atom economy

(d) Benign solvents

(vi) _____ is an example of green energy source.

(a) Microwave

(b) Ultrasound

(c) Sunlight

(d) All of the above

(b) Fill in the blanks with the appropriate word(s) **(any five)** :

(i) _____ is one of the toxic organic solvents used for the dry cleaning purposes.

(ii) _____ is extracted from orange peel using liquid CO_2 prepared from dry ice.

(iii) Roger Sheldon introduced the parameter _____ which is used frequently for measuring waste generated in various industrial processes.

(iv) Green Chemistry Principle No. 8 says _____ .

(v) _____ is the full form of Three R's.

(vi) Rearrangement is an example of atom _____ reactions.

(c) Expand the following **(any three)** :–

(i) VOCs

(ii) ISD

(iii) EPA

(iv) TBTO (6,5,3)

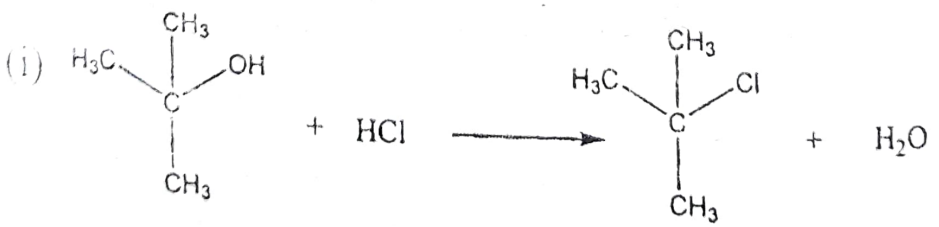
2. (a) Define Rightfit™ pigments. What are the associated advantages of using these pigments? Describe the synthetic pathway taking any example.

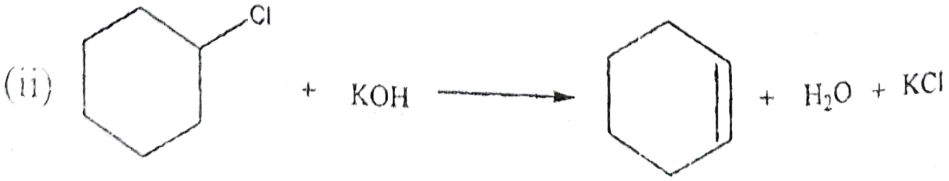
(b) What are the problems associated with the conventional solvents? Which solvents classify as green? Comment on the use of any of the green solvents highlighting its applicability.

(c) What properties of a biocatalyst make it relevant in green chemistry? Give one industrial application of a biocatalyst. (4,4,4)

3. a) What are antifouling agents? Discuss why SeaNine™ is considered as a safe marine antifoulant in comparison to the conventional one.

b) Categorize each of these reactions (addition/elimination/substitution/rearrangement) and calculate the atom economy :–

(i) 

(ii) 

(c) Explain the following briefly and correlate to the principle of green chemistry involved **(any two)** :

(i) Surfactants for carbon dioxide

(ii) PLA synthesis from corn

(iii) Solvents obtained from renewable resources

(iv) Asymmetric catalyst (4 4,4)

4. (a) Compare the two routes provided below for the synthesis of urethane. Which is greener and why? Explain the principle involved.

(i) $RNH_2 + COCl_2 \longrightarrow RNCO + 2\,HCl \xrightarrow{R'OH} RNHCOOR'$

(ii) $RNH_2 + CO_2 \longrightarrow RNCO + H_2O \xrightarrow{R'OH} RNHCOOR'$

(b) Biodiesels have emerged as cleaner alternative to the conventional fossil fuel based sources. Justify the statement. Give the reaction involved, highlighting the green principles.

(c) Draw a pyramid representing the pollution prevention hierarchy indicating the options to manage waste. Which is the least preferred option? (4,4,4)

(24)

[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 5630 **E**

Unique Paper Code : 42353605

Name of the Paper : SEC-4: Statistical Software-R

Name of the Course : **B.Sc. Mathematical Sc. / B.Sc. (Prog.)-CBCS (LOCF)**

Semester : VI

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 all **5** questions, selecting any **2** parts from each.
3. All commands should be written using language R.

1. **Total marks: (2×2=4)**

(a) Read the following stem-and-leaf plot.

The decimal point is 1 digit(s) to the right of the |

8 | 028

9 | 115578

10 | 1669

11 | 01

Now give the data as vector 'X' with R command. Also write the R command to find the five basic quartiles of the vector 'x'.

(b) Put the list of values 7, 5, 9, 2, 1, 8, 4, 2, 4, 8 into a variable 'y'. Give R commands to find the standard deviation of y and its decreasing arrangement.

(c) Write the R commands to enter the characters: Jan, Feb, Mar, Apr using the scan() command to get output: "Jan" "Feb" "Mar" "Apr".

(d) If data10=c("Jan", "Feb" ,"Mar", "Apr", "May", "Jun" ,"Jul", "Aug", "Sep", "Oct"). Write R commands to first index the characters of data 10 alphabetically, and then assign them as numbers.

2. **Total marks: 3×2 = 6**

(a) Write R commands for the data frame 'df' and its transpose.

	Test1	Test2
1	45	56
2	67	82
3	76	69
4	58	48
5	91	73

Also name the rows: A, B, C, D, E and extract the second column.

(b) Make a list grass with data

mow : 12 15 17 11 15

unmow : 8 9 7 9

Also create a data frame grass 1 by using stack() command and name the columns as 'rich' and 'graze'.

(c) Create a vector in R as

X: 6.2 7 8.5 7 6.1 3.8 8 9 10

Also give R commands for converting X into integers, and the Tukey summary values.

(d) Put the following values: 3,5,7,3,2,6,8,5,6,9,4,5,7,3,4 in a variable 'y' using scan() command in R. Also give R commands for finding first five terms and the items less than 9 & more than 6 in the variable 'y'.

3. **Total marks: 4×2 = 8**

(a) Create a vector in R as

X: 6.2 7 8.5 7 NA 6.1 3.8 8 9 NA 10

Give R commands to find the mean, median, and convert the vector X into integers.

(b) Put the following values into variable y: 3, 5, 7, NA, 2, 6, 8, 6, 9, 4, 5, 7, 3, 4, NA

Give R commands to find first five terms, the position of minimum item of 'y', and items less than 9 & more than 6.

(c) Give R command to form a 3×3 matrix :

$$\begin{pmatrix} 50 & 70 & 90 \\ 45 & 56 & 67 \\ 55 & 60 & 81 \end{pmatrix}$$

with row names : Mathematics, English, Physics and column names: S1, S2, S3, respectively.

(d) Write R command for a 3×3 matrix M:

	ENG	MATH	PHY
Suraj	24	28	25
Tanvi	18	19	20
Rahvi	20	23	16

Give R commands to print marks of Tanvi in all subjects. Also change row names to S1, S2 and S3, respectively.

Total marks: 5×2 = 10

Giving R command to make a data frame 'dfs' of two-column with a response variable (flower) and a predictor variable (site) :

flower	9	7	1	10	2	5	4	7	6	7	3	4	5	3	5	6	4	6
site	A	A	B	A	B	C	B	B	B	C	B	B	B	C	B	C	B	A

Write R commands for any two of the following :

(a) Produce a histogram and also overlay a density plot of blue color having line width 2 units with gaussian kernel for the site 'B' only.

(b) Produce a histogram for 50 random normal variates data with mean and standard deviation from data in part (a), and also overlay two density plots of data one from part (a) and second from 50 normal variates with gaussian kernel, use different colors and line types.

(c) Shapiro-Wilk normality test and normal quantile-quantile plot with a straight line for the site 'B' only. Also using apply family command to produce Shapiro-Wilk normality test for the site 'A', 'B' and 'C' respectively.

(d) Create a Portable Network Graphics image of size 650 × 450 pixels to draw a box-whisker plot of the data frame 'dfs' using light green color.

5. **Total marks: 5×2 = 10**

Giving R command to make a data frame 'df' with data :

x	2	8	13	10	12	9	14	7	15	5	18	20
y	4	16	18	13	19	17	20	14	20	11	12	15

Write R commands for any **two** of the following :

(a) To draw a scatter plot of data points (x, y) using gray color symbol '+' of 2 units size and axis labels with limits each 0 to 22. Also add a line of best fit for the data.

(b) Make a single vector 'rain' from x values of the data frame 'df' to draw a bar chart with month as names for the bars. Also label axes as 'month' and 'rainfall cm' with y limits 0 to 20 and draw gray color thin dashed horizontal lines at 0, 5, 10, 15, 20.

(c) Make a single vector 'rain' from x values of the data frame 'df to draw a pie chart clockwise with month as labels stating at 9 o'clock. Also set the colors to six shades of gray.

(d) Make a single vector 'rain' from x values of the data frame 'df' to draw a Cleveland dot plot with month as labels. Also set the color to blue and plot character 20.

[This question paper contains 4 printed pages.]

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Your Roll No.....

Sr. No. of Question Paper : 5629 **E**

Unique Paper Code : 42343602

Name of the Paper : PHP Programming

Name of the Course : **B.Sc. (Program) / B.Sc. Mathematical Science : SEC**

Semester : VI

Duration : 2 Hours Maximum Marks : 25

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. **Q.1** is compulsory.
3. Attempt any **three** questions from **Q2** to **Q7**.

1. (a) List four features of PHP. (2)

(b) How do we create a constant in PHP? Declare a constant with name *flower* and value *Rose*. (2)

(c) What will be the output of the following code : (2)

```
<?php
    $a =10;
    $b = 0;
    $val = $a && $b;
    echo ($val ? 'TRUE' : 'FALSE'),"\n";
    $val = $a and $b;
    echo (Sval ? 'TRUE' : 'FALSE');
?>
```

(d) Write PHP command to connect to a MySQL server with address "127.8.8.1". (2)

(e) Whatis the difference between substr() and strstr() functions? Explain with an example of each. (2)

2. (a) What is the purpose of using $_POST[]? Explain its usage with an example. (3)

(b) Write PHP script to delete a record from the table *Qppr(UPC integer, ppr_title varchar(2))* where UPC is *42343602*. (2)

3. What is a regular expression? Why do we require them? Create an HTML form containing Name and Phone number. Using regular expressions, (5)

(i) Check whether the entered name starts with an "A" or not.

(ii) Phone numbers should follow the format "xxx-xxxxxx" where x is a number.

4. (a) What will be the output of the following code : (2)

```
<?php
function increment(&$a)
        { ++$a; }
function decrement($a)
        { --$a; }
$val = 10;
echo "Value is = $val <br>";
increment($val);
echo "Value after incrementing is = $val <br>";
decrement($val);
echo "Value after decrementing is $val <br>";
?>
```

(b) What is difference between an associative array and an indexed array? Explain with the help of an example. (3)

5. Create an HTML form that gets *Name of employee* and *Basic salary* entered by user in text boxes. Write PHP functions to perform the following calculations : (5)

   (i) Calculate DA-

      (a) DA is 5% of basic salary if basic is less than 10000.

      (b) DA is 10% of basic salary if basic lies between 10000 and 15000.

      (c) DA is 15% of basic salary if basic is greater than 15000.

   (ii) Calculate HRA-
   HRA is 20% of DA.

   (iii) Total Salary is sum of basic, DA and HRA

6. What is meant by three tier web application development? What is the role of PHP in web application development? (5)

7. Explain the following functions with a suitable example :

   (a) ucwords() (b) implode()

   (c) substr_replacc() (d) die()

   (e) stripslashes() (5)

Name of Course:	**BSc (Prog)** (25)
Semester:	**IV/VI**
Name of the Paper:	**SEC- Basic Principles & Laboratory Operations**
Unique Paper Code:	**42173925**
Duration:	**2 hours**
Maximum Marks:	**38** S.No. :- 5672-A

Attempt any 4 questions. All questions carry equal marks.
Answers should be numbered in accordance with the number in the question paper.
Use of simple calculators is permitted.

Q1 (a) Differentiate between Determinate and Indeterminate Errors.

(b) Is a high degree of Precision same as high degree of Accuracy? Support your answer with a suitable example.

(c) Explain the term F-Test. Conduct an F-Test on the following samples:

(i) Sample-1 having variance = 108.82, sample size = 41
(ii) Sample-2 having Variance = 55.99, sample size = 21
Critical-F for (40,20) at alpha (0.025) is 2.287

3, 3, 3.5

Q2 (a) Define the following terms (Any four):

(i) Standard Deviation
(ii) Secondary Standard
(iii) Mole
(iv) Q- Test
(v) Derived Units

(b) Calculatemean, standard deviation and variance for the following data:
4, 7, 12, 13, 9,16,8

(c) Discuss the importance of calibration of volumetric glassware in laboratory? How will you calibrate Pipette in a Chemistry Laboratory?

3, 3, 3.5

Q3 (a) Write the important components of a pH meter. How is it calibrated?

(b) What is a Significant Figure? Write the number of significant figures(**any four**) in the following:

(i) 0.06900
(ii) 36
(iii) 4800
(iv) 13.20
(v) 20.00

(c) Define the term Unit. Write any two characteristics of a Unit. Name four basic measurements in our daily life.

3, 3, 3.5

Q4 (a) Write the general steps in chemical analysis. Describe briefly any one instrumental method of analysis.

(b) What are the uses of following laboratory apparatus:

(i) Desiccator
(ii) Chromatographic columns
(iii) Drying Oven
(iv) Meniscus Readers

(c) What are standard solutions? Write the difference between a primary standard and a secondary standard. Support your answer with two examples of each type.

3, 3, 3.5

Q 5 (a) Write a short note on the analytical methods that apply:

(i) Electromagnetic radiation
(ii) Electric charge

(b) A saline solution with a mass of 350 g has 40 g of NaCl in it. Calculate the percent concentration of the solute.

(c) Convert into moles:

(i) 0.7 g of NaOH
(ii) 8 g of $NaHCO_3$

3, 3, 3.5