（1）

[This question paper contains 4 printed pages.]

Sr. No. of Question Paper : 1006   A

Unique Paper Code   : 32493402

Name of the Paper   : Microbial Techniques, SEC

Name of the Course   : **B.Sc. (H) Biochemistry (CBCS-LOCF)**

Semester   : IV

Duration : 2 Hours   Maximum Marks : 50

Instructions for Candidates

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

2. Attempt **all** the questions.

1. (a) Justify the following statements (any 4) :

    (i) Prions are harmful to humans

    (ii) Pathogenic bacteria are usually gram negative

    (iii) Agar-agar is preferred over gelatin as a solidifying agent

P.T.O.

(iv) Belief in spontaneous generation is an obstacle to the development of microbiology

(v) Viruses are unique group of infectious agents

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

(i) Enveloped and non-enveloped viruses

(ii) Selective and Differential Medium

(iii) Yeast and Mould

(c) Diagrammatically depict the structural features of algal and fungal cell. (10,6,4)

2. (a) Define pure culture. Briefly describe the spread plate method of obtaining a pure culture. On plating 100 μl of a 10^{-8} dilution of a bacterial culture, 21 bacterial colonies were obtained. Calculate the CFU/ml of the undiluted suspension.

OR

Discuss the ways in which viruses may be cultivated. Define the following terms: plaque, cytopathic effect and necrotic lesion.

(b) You are given a mixed sample of *E. coli* and *Lactobacillus*. How will you identify the two species under the microscope? Explain the procedure including the role of each reagent as well as the principle of the technique. (7,8)

3. (a) The Golden Age of Microbiology was one in which many of these researchers made path-breaking discoveries or inventions. Discuss the contributions of each of these scientists :

    (i) Loius Pasteur

    (ii) Joseph Lister

    (iii) Alexander Fleming

OR

Explain briefly the mechanism of action of following sterilent :

    (i) Halogens

    (ii) Alcohol

    (iii) Heavy metals

(b) Diagrammatically explain the various bacterial morphologies by giving suitable examples.

(c) Explain with the help of a diagram the difference between simple staining and negative staining.

(6,6,3)

(10

[This question paper contains 3 printed pages.]

Sr. No. of Question Paper : 1012   A

Unique Paper Code   : 32163403

Name of the Paper   : Biofertilizers

Name of the Course   : SEC: Botany for Honours

Semester   : IV

Duration : 2 Hours 30 minutes   Maximum Marks : 38

Instructions for Candidates

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

2. Attempt any **three** questions in all.

3. Question No. **1** is compulsory.

4. Draw well labeled diagrams wherever necessary.

1. (a) Expand the Following (any four) :   (1×4=4)

    (i) AMF

    (ii) PSB

    (iii) YEMA

P.T.O.

(iv) CFU

(v) BOD

(vi) IARI

(b) Define **(any two)** :   (2×2=4)

   (i) Associative symbiosis

   (ii) Appressorium

   (iii) Starter culture

   (iv) Biological Nitrogen fixation

2. Write short notes **(any three)** :   (5×3=15)

   (a) Organic farming

   (b) *Azotobacter* as biofertilizer

   (c) Role of burrowing and nonburrowing earthworms in sustainable agriculture

   (d) Actinorrhizal symbiosis

3. (a) Why biofertilizers are better than chemical fertilizers? Compare with the help of suitable examples.   (8)

(b) Discuss briefly isolation, and culturing process of *Rhizobium*.   (7)

4. (a) Elaborate on the various methods of biocomposting and throw light on their significance as ecofriendly processes.   (8)

(b) How VAM helps in sustainable agriculture. How it differs from ectomycorrhiza?   (7)

[This question paper contains 4 printed pages.]

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.

(500)

(4)

[This question paper contains 8 printed pages.]

Sr. No. of Question Paper : 1075   A

Unique Paper Code   :   32353401

Name of the Paper   :   SEC-2 Computer Algebra Systems and Related Softwares

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

Semester   :   IV

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. There are **six** questions in all.

3. **Q1** and **Q4** are compulsory. Attempt any **two** questions from the rest.

UNIT – 1 (CAS)

Note : The answers should be written in only **one** of the CAS:Mathematica/MATLABMaxima/Maple or any other.

P.T.O.

1. Fill in the blanks : (Any ten)   (10)

    (a) Numerical value of $\frac{5}{7}$ up to 10 places are given by command _____

    (b) Command for Square of a previous output is _____

    (c) Command for 100! is _____

    (d) The output for ArcTan[$\frac{1}{4}$] is _____

    (e) The command for 7 mod 3 is _____

    (f) The command for numeric value of $\sqrt{3}\sqrt{5}$ is _____

    (g) Command for numerical approximation to 13^{20} with 15 significant digit is _____

    (h) Command for the Table of the squares of the first five positive whole numbers is _____

    (i) _____ is used to plot an implicitly defined function.

    (j) The command _____ will produce a formatted rectangular array with brackets on the sides.

    (k) The symbol _____ will simply multiply corresponding entries in the two matrices.

(1) The command for natural logarithm is _____

2. Answer any **two** parts from the following :

$$(4.5 \times 2 = 9)$$

(a) Define the function $f(x) = \cos 3x + \sin 3x$. Find its derivative and integral between the limits $[0, \pi/3]$ and write the commands for the same.

(b) Write command for sketching the curve :

$$x = 1 + \sin(t)$$

$$y = 2\cos(2t), \quad \{t, 0, 2\pi\}$$

(c) Let $A = \begin{bmatrix} 2 & 4 & 5 \\ 3 & 1 & 8 \\ 7 & 3 & 2 \end{bmatrix}$ $B = \begin{bmatrix} 7 & 5 & 1 \\ 1 & 4 & 2 \\ 3 & 1 & 2 \end{bmatrix}$

Write command for generating

    (i) Matrix $(A + B)$.

    (ii) Matrix Multiplication of A and B.

    (iii) Pointwise Multiplication of A and B.

(d) Write command for generating graph of the surface :

$$z = e^{-\left(\frac{x^2}{2} + \frac{y^2}{2}\right)} \quad \text{for } -5 \le x, \, y \le 5.$$

P.T.O.

3. Answer any **two** parts from the following :

$$(4.5 \times 2 = 9)$$

(a) Write a command to find the adjoint of matrix

$$A = \begin{pmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \\ 1 & 2 & 3 \end{pmatrix}$$

using determinant and inverse of A and check your answer by finding co-factor matrix of A.

(b) Write output of the following command

$$s = \text{SparseArray}[\text{Table}[\{i+1, 2^i\} \rightarrow i^2, \{i, 3\}]$$

and also give the command which describes positions of non zero elements in s.

(c) Let $S = \{v1, v2, v3\}$ where $v1 = \{1, 2, 3\}$, $v2 = \{1, -1, 1\}$, $v3 = \{4, 5, 9\}$

Write commands to

(i) Find nullity of the matrix whose columns are given by vectors in S.

(ii) Find whether the vector $b = \{-1, 2, 5\}$ lies in the span of S.

(d) For the matrix

$$\begin{pmatrix} 1 & 0 & 1 \\ 0 & 1 & 2 \\ 2 & 3 & 1 \end{pmatrix}$$

Write commands

(i) To find eigenvalues and eigenvectors.

(ii) To diagonalize the matrix.

UNIT – 2 (R Programming)

4. State whether the following statements are True or False : **(Any ten)**   (10)

(a) *seq (2,10,1)* command is used to form a vector 2,3,4,5,6,7,8,9,10.

(b) The command *length(frame)* gives the number of items in the data frame.

(c) The apply() command enables you to apply a function to columns only of a matrix or data frame.

(d) The command hist() is used for recalling all previous commands.

(e) The data must be all numbers or all characters to form a matrix.

(f) The NA is a special R object and always used as a character.

(g) The quantile () command is to produce 25%, 50%,75%, 100%.

(h) To access the elements of data objects ,you can use $.

(i) The data frame can not handle mixed data.

(j) The length of the following vector is 7:

week={Sun,Mon,Tue,Wed,Thu,Fri,Sat,NA}

(k) To combine data samples, you can use cbind() command.

(l) To examine the mean of the third row of a matrix named birds, you can use the command means(birds,[3,]).

5. Answer any **two** parts from the following :

(4.5×2=9)

(a) (i) Consider the data l=5,8,3,1,9,2,4,4,7,3. Write a command to remove the values 1,9,2 from the data l

(ii) For the samples:

sample1: 5, 6, 9, 12, 8

sample2: 7, 9, 13, 10

Write the command to make a data frame.

(b)   (i) Write a command to create a pie chart with labels for the following datas :

data1: 3 5 7 5 3 2 6 8 5 6 9 8

data2: "Jan" "Feb" "Mar" "Apr" "May" "Jun" "Jul" "Aug" "Sep" "Oct" "Nov" "Dec".

(ii) Find the minimum value of data1.

(c)   (i) Using scan command enter the following data: vegetables={carrot, onion, peas, brinjal}

(ii) Put the items in alphabetical order using a command.

(d)   (i) Give a command to read a file of data from a disk.

(ii) Write any command that produces multiple values as a result of the data.

6.   Answer any **two** parts from the following :

                                            (4.5×2=9)

(a) Write commands to evaluate

P.T.O.

(i) product of square roots of 30 and 50.

(ii) sum of 3rd and 5th power of pi.

(iii) sum of squares of positive divisors of 3.

(b) Write commands to

(i) read character data from the file 'names.csv'.

(ii) enter the names of months of the year having 31 days.

(iii) make a new vector from the vectors obtained in part (i) and (ii).

(c) Write commands to

(i) get the list of objects that end with 'e'.

(ii) to remove the list of all objects having letter 'b' in their name.

(iii) to get the list of all objects starting with either 'a' or 'e'

(d) Write commands to

(i) convert a vector v containing names of days of the week into numeric vector w.

(ii) get the structure of v and w.

(iii) get the structure of all available objects with 'data' in their name.

(3200)

Instructions for Candidates

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

2. Attempt **five** questions in all. All questions carry equal marks.

3. Use of non-programmable scientific calculators is permitted.

1. (a) Explain the use of multimeter for electrical measurements and testing viz resistance, capacitance, voltage (ac and dc), current (ac and dc), continuity testing, diode testing, h_{fe}. Describe the variation of least count when range is changed.

P.T.O.

(b) What is the value of unknown resistance R if the voltage drop across 500 resistor is 2.5 volts. All resistances are in ohms.
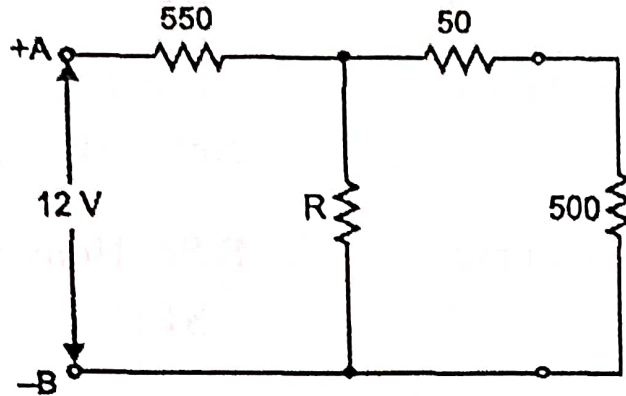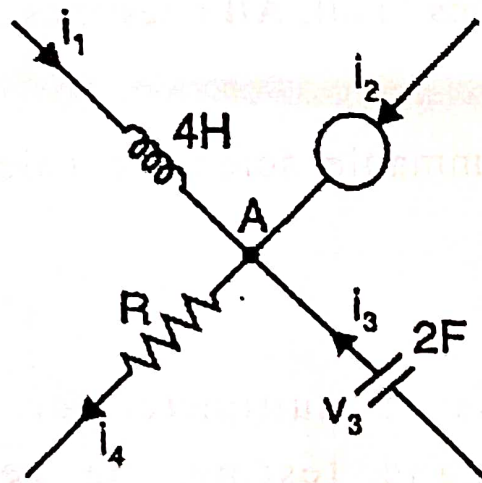

(OR)

In the network shown below, various time dependant voltages and currents are :

$$i_2 = 5 e^{-2t} \quad ; \quad i_4 = 3 \sin t \quad ; \quad v_3 = 4 e^{-2t}$$

Using KCL find voltage v_1 across 4 H inductor.

(5,5)

2. (a) Describe the construction and working principle of single phase AC generator.

(b) Consider an extension board having MCB, indicator, 4 sockets and their on / switches. Assume four different gadgets of your choice are connected in 4 sockets of extension board. Draw the electrical laddar diagram of this electrical system.   (5,5)

3. (a) Describe the construction and working of core type step up transformer. What are different energy losses in a transformer?

(b) Draw the circuit diagram of full wave bridge rectifier and explain its working. Define ripple factor.   (5,5)

4. (a) Describe construction and working principle of MCB. Explain how it protects against over current and short circuit.

(b) Explain the construction and working of Relay as a surge protection device.   (5,5)

5. (a) Write the transformation equations from star to delta and delta to star networks.

(b) With the help of star/delta transformation, obtain the value of current supplied by the battery in the circuit shown below.   (5,5)
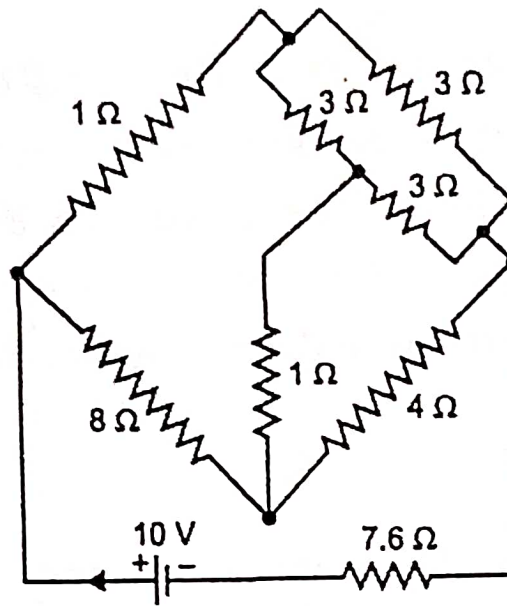
6. (a) State Norton Theorem and Maximum Power Transfer Theorem. How we apply network theorem to AC circuits?

   (b) Using Thevenin's Theorem find current in the resistor R in the circuit below.
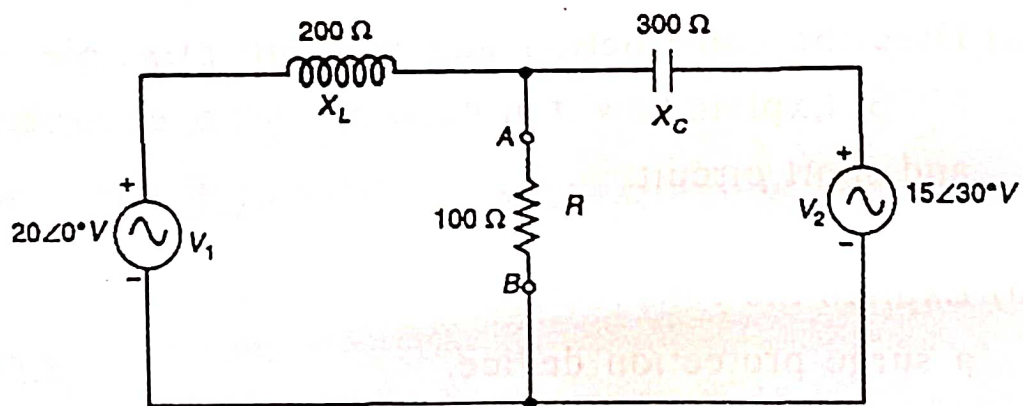
(5,5)

7. Write short note on any **two** of the following :

   (a) Conduits and Cable Trays

   (b) Over head cables and under ground cables.

   (c) Solid conductor cables and stranded cables

(5,5)

(500)

[This question paper contains 4 printed pages.]

Your Roll No. 2022

Sr. No. of Question Paper : 1087   A

Unique Paper Code   : 32223904

Name of the Paper   : Basic Instrumentation Skills

Name of the Course   : B.Sc. (Hons. + Prog.)_CBCS _SEC

Semester   : IV

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 **Five** questions in all. Question No. 1 is compulsory. All questions carry equal marks.

1. Answer any **five** of the following :

    (a) What are the general characteristics of a digital voltmeter?

    (b) When do dynamic characteristics play an important role in instruments?

P.T.O.

1087   2

(c) A 0-500 V voltmeter has a guaranteed accuracy of 2% of full-scale reading. The voltage measured by the voltmeter is 250 volts. Determine the limiting error in percentage.

(d) Define the term "retentivity" in context with CRO.

(e) How is the Q meter used for measuring the Inductance of coil?

(f) When do we say that the bridge is balanced? Justify.

(g) Explain briefly two important features of an electronic voltmeter.

(h) What is Lissajous pattern?   (5×2)

2. (a) Why do most manufacturers specify the accuracy of instruments within a certain percentage of a full scale reading instead of specifying accurately?

(b) What is the significance of sensitivity in voltmeters? What will happen if a voltmeter of low sensitivity is used? Explain it with examples of loading effect.   (4+6)

3. (a) Explain the principle of voltage measurements in an AC millivoltmeter with a block diagram.

   (b) Discuss the specifications of an AC millivoltmeter.

                                                (6+4)

4. (a) Draw the basic block diagram of an Oscilloscope and explain the function of each block.

   (b) Explain in brief how the measurement of AC and DC voltages along with frequency can be done using a CRO.   (6+4)

5. (a) Differentiate between pulse and square wave generator.

   (b) Write the specifications of a LCR bridge and discuss the importance of a LCR bridge.   (4+6)

6. (a) What are digital voltmeters? List its six performance characteristics.

   (b) A 3 – 1/2 digit voltmeter is used for voltage measurement. Find its resolution. How would 0.6297 V be displayed on 1 V and 10 V ranges.

                                                (6+4)

                                                P.T.O.

7. (a) Explain the working principle of a frequency counter with regard to time interval, frequency and period measurements.

(b) What do you understand about the accuracy and the resolution of a frequency counter?   (6+4)

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)

5. (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 ^{1}H NMR spectroscopy?

    (c) Calculate the probable λ_{max} value for the following molecule
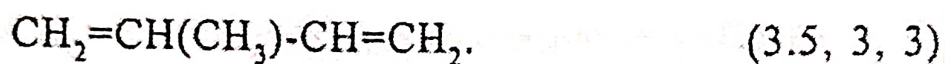
    $CH_2=CH(CH_3)-CH=CH_2$.   (3.5, 3, 3)

(8)

[This question paper contains 4 printed pages.]

Your Roll No...12.5.12.2

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)

[This question paper contains 4 printed pages.]

Your Roll No. 12.5/22

Sr. No. of Question Paper : 1441   A

Unique Paper Code   : 32223905

Name of the Paper   : Renewable Energy and Energy Harvesting

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

Semester   : CBCS Part-II (Sem-IV) SEC

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.   **Q.1 is compulsory.**

P.T.O.

1. Answer **any five** of the following: (10)

   (a) Why is solar energy really a form of nuclear energy?

   (b) What is the difference between renewable energy and renewable energy technology?

   (c) What is coefficient of performance?

   (d) Write a short note on biomass energy.

   (e) What is solar thermal heating?

   (f) Explain the applications of photovoltaic system.

   (g) What is the piezoelectric effect and how does it work?

   (h) Explain Solar cooker.

2. (a) Describe the construction solar water heater. What is a flat plate collector? Give two important applications of solar water heater. (3,2,2)

(b) Give an overview of energy harvesting in a solar pond. (3)

3. (a) Explain the working of two axis sun tracker. (5)

(b) Give working mechanism of non-convecting solar pond. (5)

4. (a) Describe the construction solar distillation unit. What is the principle behind the working of solar distillation? Give two important applications of solar distillation. (3,2,2)

(b) Give an overview of solar green house. (3)

5. (a) What is absorption Air Conditioning? Explain its working. (6)

(b) Write a short note on vertical axis wind turbine technologies. (4)

6. (a) What is piezoelectricity? Write a constitutive equation for piezoelectricity. Discuss various piezoelectric parameters. (7)

P.T.O.

(b) What is the performance of piezoelectric materials in energy harvesting?   (3)

7. (a) What is the electromagnetic energy harvesting? Explain the most common methods to convert energy of electromagnetic waves into electricity?   (7)

(b) Discuss I-V characteristics of solar cell. What are the fill factor and efficiency of solar cell?   (3)

[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

P.T.O.

(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?

P.T.O.

(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.2022

Sr. No. of Question Paper : 1484

A

Unique Paper Code : 42353405

Name of the Paper : Sec-2 Mathematical Typesetting System: LaTex

Name of the Course : B.Sc. Mathematical Science-CBCS: Skill Enhancement

Semester : IV

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 **two** parts of each question.

1. (i) Define footnotes and write appropriate commands in Latex with example?

   (ii) Write the input command in latex to produce the following :

P.T.O.

$$\int_0^1 x^5 \sqrt{\frac{1+x^2}{1-x^2}}\, dx \, .$$

(iii) What is the difference between the following commands in latex?

   (a) \; and \:

   (b) \ddots and \vdots.

(iv) Correct the following input as per Latex commands :

\(\left \{\frac{\mu. \tau) {\mu + tau] \right}\).

2. (i) Create a latex file for the following output :

Latex Assignment

XYZ

University of Delhi,

Delhi.

(ii) Explain the following environment with example :

   (a) enumerate

       (b) itemize

       (c) math

       (d) array

(iii) In an array environment, what is the meaning of these alignments: (c, l, r, and &) Justify these alignments with an example?

(iv) Define cases environment with example.

3. Write the code in LaTex to get the following output : (4)

(a) $(y-a)^n \neq \sum_{k=0}^{n} a^{n-k}$.

(b) $(1+x)^{1/n} \neq 1 + \dfrac{nx}{1!} + \dfrac{n(n-1)x^2}{2!} + \ldots\ldots$

(c) $\sqrt[7]{\dfrac{a+b}{c+d}} + \sqrt[4]{g}$.

(d) Consider the sets B_1, B_2, B_3.

      Then $B_1 \cap (B_2 \cup B_3) = (B_1 \cap B_2) \cup (B_1 \cap B_3)$.

P.T.O.

4. Write the code in LaTex to get the following output : (8)

(a) The Difference equation

$$x_t = ax_{t-1} + b_t (t = 1,2,3,...)$$

has the solution

$$x_t = ax_0 + \sum_{k=1}^{t} a^{t-k} b_k \ (t = 1,2,3, ...)$$

(b) Define the discontinuous factor D_t by

$$D_t = \frac{1}{\prod_{s=1}^{t}(1+r_s)}$$

$$= \prod_{s=1}^{t}(1+r_s)$$

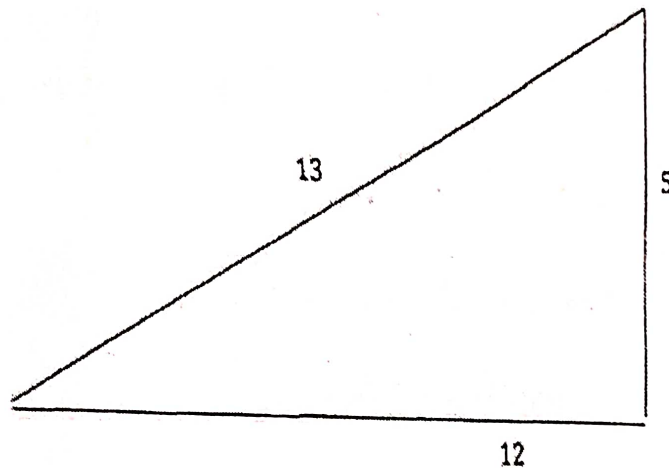(c) $\int \dfrac{e^x}{\sqrt[3]{1+e^x}} = \dfrac{3}{2}\left(1+e^x\right)^{3/2} + C$

(d) $Sin\,x = \dfrac{x}{1!} - \dfrac{x^3}{3!} + \dfrac{x^5}{5!} - \dfrac{x^7}{7!} + \cdots$

$$\sin(-1) = \frac{(-1)^0}{1!} - \frac{(-1)^3}{3!} + \frac{(-1)^5}{5!} - \frac{(-1)^7}{7!} + \cdots$$

1484   5

5. (a) Write the command in PSTricks to draw the following picture.

(b) Explain the command \psarc (0,0) {2.5} {10} {80}.

(c) Write the command to draw an arrow at (3,2) of length 15 units in the direction of (1,1).

(d) Write the command in PSTricks to plot the function $y = \sin x$.   (6)

6. (a) Write a presentation in beamer with the following content :

Slide-1: Title: Odd

P.T.O.

Step-1. Any integer that cannot be divided by 2 is an odd integer.

Examples: 1,3,5,7,....

Slide-2: Title: Even

Step-2. Any integer that can be divided by 2 is an even integer.

Examples: 2,4,6,8,....

Slide-3: Title: Composite

Step-3. Any integer that can be divided by atleast one other number (a factor not 1) other than itself.
Examples: 4, 6, 8, 10, ...

(b) Using beamer prepares a presentation with the following content :

Slide 1: Title: Beamer presentation

Step-1, $\sin \alpha$ and $\cos \alpha$ are two trigonometric functions.

Slide 2: Title: Some trigonometry identities:

Step-2.

$$\sin^2\theta + \cos^2\theta = 1$$

$$2\sin\theta\cos\theta = \sin 2\theta.$$

Slide 3: Title: Beamer presentation

Step-3. Thank You

(c) In beamer, write the command to produce the information about the title page that contains title, author, institute and date.

(d) Write a presentation in beamer with the following content:

Slide-1: Title: Differentiable function

Step-1. Let f be differentiable at $x = c$. Then

$$f'(c) = \lim_{x \to c}\left(\frac{f(x) - f(c)}{x - c}\right).$$

Slide-2: Title: Differentiable function

Step-2. Now

$$\lim_{x \to c}(f(x) - f(c)) = \lim_{x \to c}\left(\frac{f(x) - f(c)}{x - c}\right) \times (x - c)$$

$$= f'(c) \times 0.$$

Slide-3: Title: Differentiable function

Step-3. $\lim_{x \to c} f(x) = f(c)$. Therefore, f is continuous at $x = c$.