BSCCHC 382/BSCCHC 358

Choice Based Credit System/Credit Based VI Semester B.Sc. Degree
Examination, September 2022
(2020 – 21 and Earlier Batches)/(2021 – 22 Batch Onwards)
CHEMISTRY (Paper – VIII)

Time : 3 Hours

Max. Marks : 80

Instructions : 1) A single booklet containing **40** pages will be **issued**.
No additional sheets will be issued. Write questions
number and subdivisions **clearly**.

2) Write equations and diagrams **wherever** necessary.

3) Answer Part – **A** in the **first two** pages of answer book.

4) Scientific calculators are **allowed**.

PART – A

I. 1) Answer **any ten** of the following.

(2×10=20)

a) State Beer-Lambert's law.

b) What type of compounds absorbs UV radiations ? Give an example.

c) State Frank-Condon principle.

d) What is meant by chemical shift in NMR spectra ?

e) State Koopman's theorem.

f) Mention any two advantages of NMR spectroscopy.

g) Write any two applications of mass spectroscopy.

h) Define octane number.

i) Mention the composition of crude oil.

j) What is isoprene rule ?

k) How sulphanilamide is prepared ?

l) What are insecticides ? Give an example.

PART – B

II. Answer **any four** questions, selecting **any one** question from **each** Unit. **Each** question carries **15** marks.

(15×4=60)

Unit – I

2) a) Explain different electronic transitions that take place when a molecule absorbs UV or visible radiation.   4

   b) Write any four differences between colorimeter and spectrophotometer.   4

   c) i) Derive an expression for Beer-Lambert's law.   4

   ii) What are chromophores and auxochromes ?   3

3) a) Write a note on the following terms giving example for each.

   i) Blue shift   ii) Hyperchromic shift.   3

   b) Describe the instrumentation of UV spectrophotometer with a neat schematic diagram.   5

   c) i) What are the important properties of colored system suitable for measurements ?   4

   ii) Explain the validity of Beer-Lambert's law.   3

Unit – II

4) a) Explain the theory of NMR spectroscopy taking proton as an example.   4

   b) Discuss spin-spin coupling with suitable example.   4

   c) i) Write a note on nuclear shielding and deshielding.   4

   ii) Explain the photoelectron spectrum of oxygen atom.   3

5) a) Discuss the instrumentation in photoelectron spectroscopy.   3

   b) Describe the functioning of NMR spectrometer with a neat schematic sketch.   5

   c) i) Explain the factors affecting position of signals in NMR spectra.   4

   ii) Analyse the NMR spectrum of ethyl acetate.   3

Unit – III

6) a) Explain McLafferty rearrangement with suitable example. 4

   b) Discuss the various steps involved in the refining of petroleum. 4

   c) i) Explain thermal cracking. 4

   ii) Describe isotopic ion peak with suitable example. 3

7) a) Write a note on ring rule. 3

   b) Discuss fixed bed catalytic cracking. 5

   c) i) Give the fragmentation pattern of ammonia molecule showing base peak and isotopic ion peak. 4

   ii) What are petrochemicals ? Give any two applications. 3

Unit – IV

8) a) Give the method of preparation of DDT and BHC. 4

   b) Elucidate the structure of geraniol. 4

   c) i) Give the synthesis of sulphathiazole and antipyrene. 4

   ii) Discuss the importance of pesticides. 3

9) a) Describe briefly the health effects of endosulphan. 3

   b) Explain the synthesis of citral. 5

   c) i) How is aspirin prepared ? How it causes 'back diffusion' in stomach ? 4

   ii) Explain the preparation of Bordeaux mixture. 3

Reg. No. ☐☐☐☐☐☐☐☐

BSCPHC 357

Credit Based VI Semester B.Sc. Degree Examination, September 2022
(2020 – 21 and Earlier Batches)
PHYSICS (Paper – VII)
Nuclear Physics

Time : 3 Hours

Max. Marks : 80

Instructions : 1) *Answer questions from all Units.*
2) *Multiple choice questions must be answered in the first two pages of the answer book.*
3) *Scientific calculators are allowed.*

PART – A

1. Answer the following questions by choosing the most appropriate answer. **(1×10=10)**

   i) The heaviest stable nucleus is

   a) $_{209}Bi$ b) $_{208}Pb$ c) $_{207}Pb$ d) $_{206}Pb$

   ii) β particle is an electron of _____ origin.

   a) Atomic   b) Nuclear
   c) Both of the above   d) None of these

   iii) Condition for secular equilibrium is

   a) Half-life of parent is equal to that of daughter element
   b) Half-life of parent is less than that of daughter element
   c) Half-life of parent is slightly greater than that of daughter
   d) Half-life of parent is very large compared to that of daughter

   iv) Which of the following form the pair of mirror nuclei ?

   a) $_6C^{11}$ and $_5B^{11}$ b) $_3Li^7$ and $_4Be^7$
   c) $_1H^3$ and $_2He^3$ d) All of these

   v) The nuclear quadrupole moment of nuclei containing magic number of nucleons is

   a) Positive   b) Negative
   c) Zero   d) None of these

vi) If 5 gram of U-235 is completely destroyed in a reactor, the energy released would be

a) 45×10^3 J   b) 15×10^{10} J   c) 45×10^{17} J   d) 60×10^{15} J

vii) Nuclear reactor at Kaiga is

    a) Research reactor   b) Fusion reactor

    c) Breeder reactor   d) Power reactor

viii) Neutrino belongs to the family called

    a) Hadrons   b) Leptons

    c) Baryons   d) Hyperons

ix) The maximum energy gained by the electron in a betatron is

    a) $B\,e\,r\,C$ b) $B\,e\,r^2\,C$

    c) $B^2\,e\,r\,C$ d) $B\,e\,r\,C^2$

x) Cosmic rays were discovered by

    a) Thomson   b) Curie   c) Hess   d) Millikan

2. Answer **any five** of the following :   **(2×5=10)**

   i) Give the empirical relation between range and velocity of an alpha particle.

   ii) According to Pauli's theory how many types of neutrinos are there ? What is the difference between them ?

   iii) Show that nuclear density is constant.

   iv) Which has higher binding energy $_1H^3$ or $_2He^3$? Comment on the difference.

   v) How are thermal neutrons produced ?

   vi) Name the four basic interactions of the nature.

   vii) Draw GM characteristics.

PART – B

Unit – I

3. a) State and explain Geiger-Nuttal law.

   b) With elements A, B and C forming a radioactive series (C being stable), derive an expression for the number of atoms of B if at start B was not present in the sample. Hence derive the condition for secular equilibrium.   **(4+6)**

OR

4. a) What is radioactive dating ? Explain radio carbon dating.

  b) Explain 3 types of Beta decay, using Paulis neutrino hypothesis. What are the condition for the emission of $\beta+$ and electron capture ?

(4+6)

5. a) Radon the disintegration product of radium is in equilibrium with 1 gram of radium. Find the mass of radon. Half-life of Ra-226 = 1590 years, Rn-222 = 3.82 days.

OR

5

  b) 1 gram of radium is reduced by 2.1 mg in 5 years by alpha decay. Calculate the half-life period of radium.

5

Unit – II

6. a) Explain how shell model accounts for the first 3 magic numbers.

  b) Derive α particles scattering formula assuming expression for impact parameter. Also mention the factors on which the number of α-particles scattered depend.

(4+6)

OR

7. a) Using Heisenberg's uncertainty principle estimate the rest mass of meson assuming the range of nuclear forces as 1.5 fm.

  b) What is a mass spectrograph ? Describe with theory Dumpster's mass spectrograph. Explain how isotopic abundances can be determined.   **(4+6)**

8. a) In a Dumpster's mass spectrograph a 1000 V accelerating potential brings singly ionized Mg – 24 on the slit. Calculate the potential difference to bring singly ionized Mg – 25 on the slit, the magnetic field being kept constant.   **5**

OR

  b) In Rutherford α-ray scattering experiment, the flux of α-particles observed at 100 is 106 per minute. Calculate the flux of α-particles observed at (i) 90° (ii) 180°.

5

Unit – III

9. a) Write a short note on fast breeder reactors.

  b) Explain nuclear fission with an example. Obtain the four factor formula for thermal reactors and discuss the condition for criticality.   **(4+6)**

OR

10. a) Give Rutherford's experiment on artificial transmutation.

b) With a diagram explain working of a nuclear reactor. What is the difference between pressurised water reactor and boiling water reactor ?   **(4+6)**

11. a) It is proposed to produce 100 MW of electrical power on an average in a nuclear reactor having 20% efficiency, using U-235. Calculate the amount of U-235 required per day for continuous operation. Given energy released per fission of U-235 is 200 MeV.   **5**

OR

b) Show by mass-energy calculation whether the following reactions are endoergic or exoergic. 14N (α, p) 17 O.   **5**

Unit – IV

12. a) Explain the working of a semiconductor detector.

b) Explain the classification of fundamental particle with respect to mass, spin and interaction.   **(4+6)**

OR

13. a) Explain Van Allen radiation belts.

b) With neat diagram explain the working of linear accelerator.   **(4+6)**

14. a) A cyclotron accelerate protons to 4 MeV. To what energy will the cyclotron accelerate (a) alpha particles and (b) deuteron.   **5**

OR

b) In a certain betatron the maximum magnetic field at orbit was 0.4 Weber/m^2, operating at 50 Hz with a stable orbit diameter of 1.524 m. Calculate the average energy gained per revolution and the final energy of the electrons.   **5**

Reg. No.

BSCPHC 358

Credit Based VI Semester B.Sc. Degree Examination, September 2022
(2020 – 21 and Earlier Batches)
PHYSICS (Paper – VIII)
Electronics

Time : 3 Hours

Max. Marks : 80

Instructions : i) Answer questions from all Units.
                ii) Multiple choice questions must be answered in the first page of
                    the answer book only.
                iii) Scientific calculators are allowed.

PART – A

1. Answer the following questions by choosing the most appropriate answer.   (1×10=10)

   i) In a Zener voltage regulator, the Zener diode is _____ biased.
      a) Forward   b) Reverse
      c) Both forward and reverse   d) Unbiased

   ii) CMRR of an OPAMP is 10^4. Its value in dB is
      a) 100   b) 40   c) 80   d) 60

   iii) For an OPAMP which of the following is true ? OPAMP amplifies.
      a) DC signal   b) AC signal
      c) Difference of two inputs   d) All [a), b) and c)]

   iv) A n-channel e-MOSFET can be operated with
      a) Positive gate voltage only
      b) Negative gate voltage only
      c) Both positive and negative gate voltages
      d) Gate voltage above threshold

   v) In a feedback amplifier feedback fraction is 1/4. To obtain oscillation gain of
      the amplifier is
      a) +3   b) −3   c) −4   d) 4

   vi) Oscillators are the amplifiers with input supplied them is
      a) 0   b) ∞   c) 1   d) −1

P.T.O.

vii) OR gate produces output state 1 when
   a) Both the inputs in state 0
   b) Both the inputs and either of the inputs state 1
   c) Either of the inputs state 1
   d) Both the inputs in state 1

viii) Serial shift register is the one in which data were entered
   a) One bit at a time
   b) All the bits at same time
   c) More than two bits at a time
   d) All of the above

ix) In amplitude modulation, side bands contain _____ of useful power of total power AM transmitted.
   a) 33.33%
   b) 50.33%
   c) 100%
   d) 66.66%

x) In satellite communication angular separation between three satellites to cover entire earth (except polar region) is
   a) 60°
   b) 120°
   c) 180°
   d) 90°

(2×5=10)

2. Answer **any five** of the following :
   i) Draw input and output wave forms of a full wave rectifier.
   ii) What are the values of cut off frequency and band width of IC 741 ?
   iii) Distinguish between BJT and FET.
   iv) Give any two comparisons between positive and negative feedbacks.
   v) Draw the logic diagram using NAND gates for the equation $Y = A + B$.
   vi) Give the truth table of half adder circuit.
   vii) Draw a block diagram for CRT.

PART – B
Unit – I

3. a) Construct Zener voltage regulator circuit and explain its working in terms of line regulations.

   b) Explain the concept of virtual ground. Construct OPAMP inverting amplifier and obtain expression for voltage gain.

OR

4. a) What are the characteristics of ideal OPAMP ? Describe any two characteristics of IC 741.

   b) Explain with a circuit diagram, the working of full wave bridge rectifier and obtain expressions for ripple factor and efficiency.

5. a) In a Zener voltage regulator, find line current, load current, Zener current and power dissipated across the load R_L from the data given below :

Given : $V_i = 50$ V, $R_s = 5$ KΩ, $V_z = 10$ V and $R_L = 5$ KΩ. 5

OR

b) Using OPAMP it is required to design inverting and non-inverting amplifiers. For an input resistance of 1 kΩ and input voltage of 1 V, non-inverting amplifier produces output voltage of 6 V. Determine gain and feedback resistance of non-inverting amplifier. If same combination of resistors were maintained, what would be the gain of the inverting amplifier ? 5

Unit – II

6. a) Using concept of feedback obtain a condition for Barkhausen criterion. 4

b) Using suitable diagrams give the construction and working of n-channel e-MOSFET. 6

OR

7. a) Explain drain and transfer characteristics of d-MOSFET. 4

b) What is an oscillator ? With a circuit diagram explain the working of RC phase shift oscillator. 6

8. a) The voltage gain of an amplifier with 5% negative feedback is 100. What is the gain without feedback ? Also find the loop gain. 5

OR

b) Using following experimental data of e-MOSFET find :

i) $V_{GS\,(th)}$ voltage

ii) AC drain resistance

iii) Trans-conductance

iv) Amplification factor. 5

$I_{D\,(ON)}$ = 4 mA, k = 0.278 mAV^{-2} at V_{GS} = 6.793 V.			
V_{GS} (V)	4	4	5
V_{DS} (V)	7	12	12
I_D (mA)	8	8.5	8.25

Unit – III

9. a) Construct RS flip-flop using NOR gate and explain its operation. 4

   b) Construct and realize the logic patterns of NOT, AND, OR and XOR gates using NAND gate. Comment on the overall result. 6

OR

10. a) Using a block diagram explain the working of BCD to seven segment decoders. 4

   b) Construct mod 10-decade counter. Use timing diagram and truth table to explain its working. 6

11. a) Simplify the following Boolean equation and draw logical diagram for it.

   $Y = A\overline{B} + A\overline{BC} + AB\overline{CD} + ABCD$ 5

OR

   b) Table given below shows output state 1 for following combination of inputs. Using sum of product method set SOP equation, simplify and draw logic diagram for it. 5

A	B	Fundamental product
1	0	
0	1	
1	1	

Unit – IV

12. a) Describe any two applications of CRO. 4

   b) Derive an expression for the instantaneous voltage of an AM wave and obtain an expression for total power in terms of Modulation index. 6

OR

13. a) What is demodulation ? Explain demodulation using diode detector. 4

   b) Describe the role of ionosphere in sky wave propagation and explain :
   i) Skip distance
   ii) Maximum usable frequency. 6

14. a) A sinusoidal carrier wave of frequency 10 MHz and amplitude of 60 V is amplitude modulated by 2 KHz wave with modulation index 40%. Find the side band frequencies and their amplitudes. What is the band width of modulated wave ? 5

OR

   b) An AM transmitter radiates radio-wave of 30 kW at modulation index 80%. Calculate the percentage of power associated with carrier wave and each of the side bands. 5

Reg. No. ☐☐☐☐☐☐☐☐☐☐

BSCMTC 358

Credit Based VI Semester B.Sc. Degree Examination, September 2022
(2020-21 and Earlier Batches)
MATHEMATICS
Partial Differential Equations, Fourier Series and Linear Algebra

Time : 3 Hours   Max. Marks : 120

Instructions : 1) *Answer **any ten** questions from Part – **A**. **Each** question carries **3** marks.*
2) *Answers to Part – **A** should be written in the **first few** pages of the answerbook before answers to Part – **B**.*
3) *Answer **five full** questions from Part – **B** choosing **one** full question from **each** Unit.*
4) *Scientific **calculators** are allowed.*

PART – A

Answer **any ten** questions :   (10×3=30)

1. Verify the integrability condition for $(y^2 + yz)\, dx + (xz + z^2)\, dy + (y^2 - xy)\, dz = 0$.

2. Eliminate 'a' and 'b' from $\dfrac{x^2 + y^2}{a^2} + \dfrac{z^2}{b^2} = 1$.

3. Find the complete integral of $p^2 + q^2 = 4$.

4. State the Dirichlet's conditions for Fourier series expansion of a function.

5. If $f(x) = \begin{cases} 1, & 0 < x < 1 \\ -1, & 1 < x < 2 \end{cases}$, find the Fourier coefficient a_0.

6. Write the complex form of the Fourier series of a function and the formula for the complex Fourier coefficient.

7. Determine whether the vectors $V_1 = (1, 0, 2)$, $V_2 = (1, 1, 1)$ and $V_3 = (4, 5, 3)$ of R^3 are linearly independent.

8. If V is a vector space over F, then prove that $a.v = 0 \Rightarrow$ either $a = 0$ or $v = 0$ where $a \in F$ and $v \in V$.

P.T.O.

9. In an inner product space V = R, if v is orthogonal to v′ then prove that $\|v + v'\|^2 = \|v\|^2 + \|v'\|^2$ where v, v′ ∈ V.

10. If A is a nilpotent matrix, then prove that I + A is non-singular.

11. Let T : V → V′ be a linear transformation. If $V_1, V_2, ..., V_n$ are elements of V such that $T(V_1), ..., T(V_n)$ are linearly independent. Show that $V_1, V_2,...., V_n$ are linearly independent.

12. Let T : R³ → R³ be defined by T(x, y, z) = (x, 2y, x + y + z). Find the dimension of T(V).

13. Find the rank of the matrix $\begin{pmatrix} 2 & 3 & -1 \\ -1 & 0 & 4 \\ 4 & 5 & 8 \end{pmatrix}$ using elementary row operations.

14. Find the characteristic roots of $A = \begin{pmatrix} 3 & 2 \\ 2 & 0 \end{pmatrix}$.

15. Prove that every non singular matrix is a product of elementary matrices.

PART – B

Unit – I

1. a) Eliminate the arbitrary function 'f' from $f(x^2 + y^2 + z^2, z^2 - 2xy) = 0$.　　6

    b) Solve (y + z) p + (z + x)q = x + y by Lagrange's method.　　6

    c) Solve : p(1 + q) = qz.　　6

2. a) Assuming integrability condition, solve $(yz + z^2)dx - xzdy + xydz = 0$.　　6

    b) Obtain the partial differential equation of all spheres whose centres lie on the z-axis.　　6

    c) Solve $p^2 + q^2 = x + y$.　　6

Unit – II

3. a) Find the Fourier expansion of the periodic function whose definition in one period is $f(x) = \begin{cases} 0 & -\pi \le x \le 0 \\ \sin x & 0 \le x \le \pi \end{cases}$.　　9

    b) Find the half range sine and cosine expansions of the function f(x) = x, 0 < x < 2.　　9

4. a) Expand $f(x) = x^2$ in Fourier series over the interval $(-p, p)$. Hence show that $\dfrac{1}{1^2} - \dfrac{1}{2^2} + \dfrac{1}{3^2} - \dfrac{1}{4^2} + \dots = \dfrac{\pi^2}{12}$.

BSCMTC 358

b) Find the complex form of Fourier series of the function whose definition in one period is $f(x) = e^{-x}$, $-1 < x < 1$. 9

9

Unit – III

5. a) Let V be a vector space over F and let $\{w_\alpha\}_{\alpha \in I}$ be a collection of subspaces of V, prove that $W = \bigcap_{\alpha \in I} w_\alpha$ is also a subspace of V.

6

b) Let V be a vector space of dimension n. Then prove that any set of m linearly independent elements $(m \le n)$ can be completed to a basis of V. 6

c) Define an inner product space. Prove that any orthonormal set in an inner product space V is linearly independent.

6

6. a) Prove that the set $\{V_1, V_2, \dots, V_n\}$ is a minimal generating set for V if and only if it is a basis of V.

6

b) Prove that V is a direct sum of subspaces V_1 and V_2 if and only if every $v \in V$ can be expressed uniquely as $v = v_1 + v_2$, $v_1 \in V_1$, $v_2 \in V_2$. 6

c) Let V be an inner product space, prove that $|<v, v'>| \le \|v\| \|v'\|$, for all $v, v' \in V$.

6

Unit – IV

7. a) Define a linear transformation. Prove that a linear transformation $T : V \to V'$ is a one to one mapping if and only if Ker T = {0}. 6

b) Test the columns of $A = \begin{bmatrix} 1 & 0 & 3 \\ -1 & 0 & 4 \\ 3 & 2 & 0 \\ 4 & 1 & 0 \end{bmatrix}$ for linear independence and hence find its column rank.

6

c) Prove that a linear transformation T is an isomorphism if and only if m(T) is a non singular matrix.

6

Reg. No. ☐☐☐☐☐☐☐☐

BSCMTC 359

Credit Based VI Semester B.Sc. Examination, September 2022
(2020 – 21 and Earlier Batches)
MATHEMATICS
Special Paper – VIII (a) : Graph Theory

Time : 3 Hours   Max. Marks : 120

Instructions : 1) Answer **any ten** questions from Part – **A**. **Each** question carries **3** marks.

2) Answers to Part – **A** should be written in the first few pages of the answer book before answers to Part – **B**.

3) Answer **five full** questions from Part – **B** choosing **one** full question from **each** Unit.

4) Scientific calculators are **allowed**.

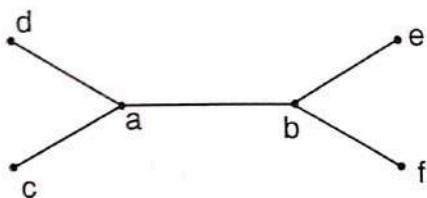PART – A

1. Define (i) Euler graph (ii) Euler line.   **3**

2. If a graph has exactly two vertices of odd degree, then prove that there must be a path joining these two vertices.   **3**

3. Prove that in any tree with two or more vertices there are atleast two pendent vertices.   **3**

4. Find the center of the graph by finding eccentricity of each vertex in the following graph.   **3**


5. Define spanning tree with an example.   **3**

3

6. Define (i) Edge connectivity (ii) Vertex connectivity.

7. Prove that every cutset in a connected graph G must contain atleast one branch of every spanning tree of G.

3

8. Define separable graph with an example.

3

9. Write the path matrix $P(V_1, V_4)$ for the vertices V_1 and V_4 for the given graph.

3
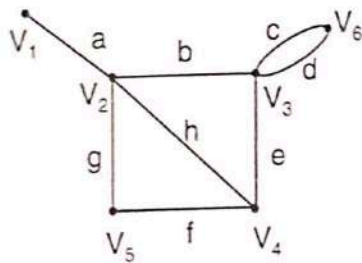
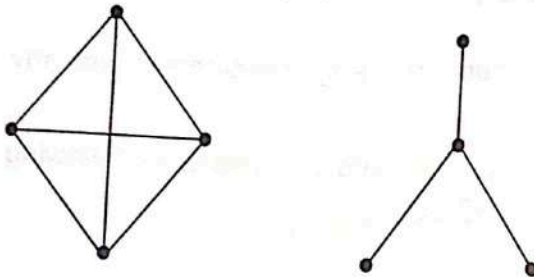

10. Check whether the given graph is a bipartite graph.

3
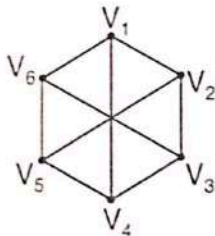
11. Write the chromatic number for the following graphs.

3
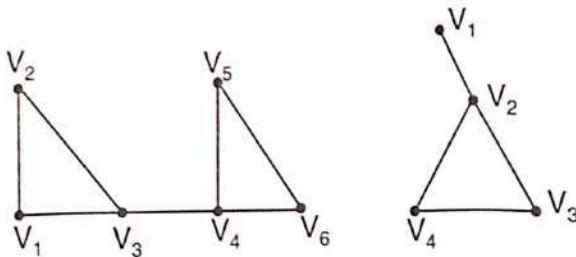
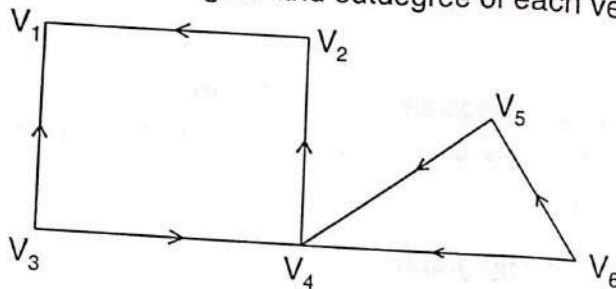12. Write the chromatic polynomial of the following graphs.

3

13. Prove that the number of simple labelled graphs with n vertices is $2^{\frac{n(n-1)}{2}}$.

3

14. Write the indegree and outdegree of each vertex in the following graph.

3

15. Define (i) Simple digraph (ii) Directed path (iii) Asymmetric digraph.

3

PART – B

Unit – I

16. a) Prove that a connected graph G is a Euler graph iff G can be decomposed into circuits.

6

   b) Prove that a graph G is disconnected if and only if their vertex set V can be partitioned into two disjoint subset V_1 and V_2 such that there is no edge in G whose one end vertex in V_1 and another vertex in V_2.

6

   c) Define degree of a vertex and regular graph. Prove that the number of vertices of odd degree in a graph is always even.

6

17. a) Define distance in a graph. Prove that distance between two vertices in a connected graph is a metric.

6

   b) Prove that every tree has either one or two centres.

6

   c) Define binary tree. Prove that the number of pendent vertices in a binary tree with n vertices is $\left(\frac{n+1}{2}\right)$.

6

Unit – II

18. a) Prove that every circuit has an even number of edges in common with any cutset.   6

   b) Define a fundamental circuit and list 5 fundamentals circuits of the following graph with respect to a spanning tree $\{C_1, C_2, C_3, C_4\}$.   6
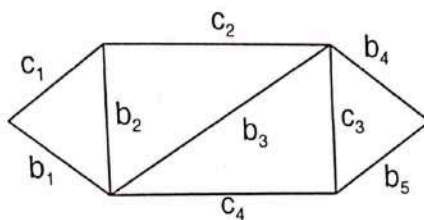
   c) Prove that with respect to a given spanning tree T, a branch b_i that determines a fundamental cutset S is contained in every fundamental circuit associated with the chords in S and in no other.   6

19. a) Draw a geometric dual of the following graph.   6
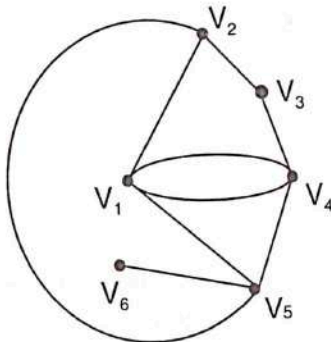

   b) Prove that Kuratowski's second graph $K_{3,3}$ is non-planar.   6

   c) Prove that a graph can be embedded in the surface of a sphere if and only if it can be embedded in a plane.   6

Unit – III

20. a) Prove that the rank of the incidence matrix of a connected graph of n vertices is n – 1.

6

b) Prove that the ring sum of two circuits in a graph is either a circuit or an edge disjoint union of circuits.

6

c) Write the adjacency matrix of the following graph.

6
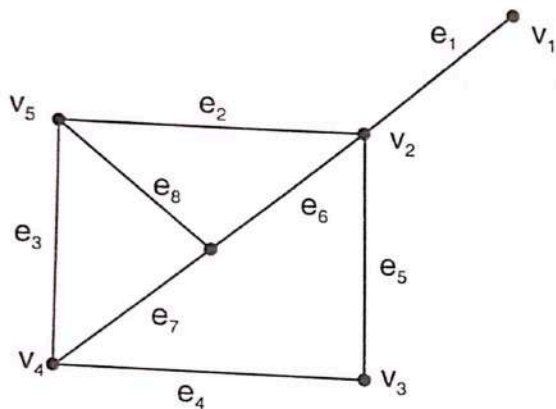
21. a) Prove that the rank of the cutset matrix C(G) is equal to the rank of the incidence matrix A(G) is equal to the rank of the graph G.

6

b) Let B and A be respectively the circuit matrix and the incidence matrix of a self loop free graph whose columns are arranged in the same order of edges. Then prove that $A.B^T \equiv 0$ (mod 2).

6

c) Write the incidence matrix of the following graph.
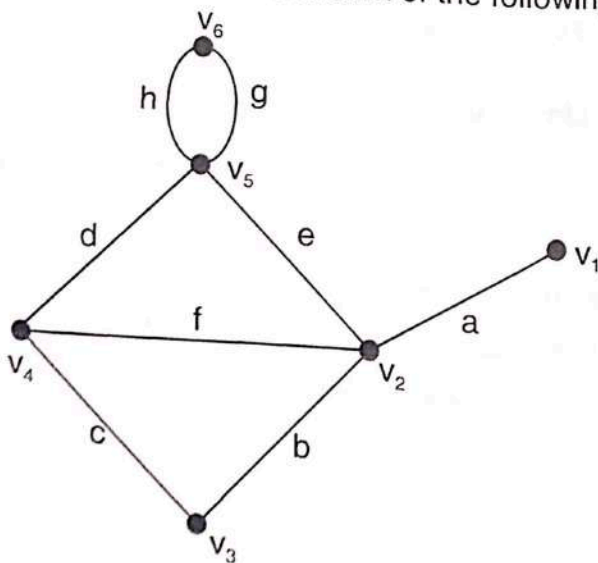
6

Reg. No.

Time : 3 Hours

Max. Marks : 80

PART – A

1. Answer **any ten** of the following questions.   (10×2=20)

   a) Mention any four types of applications that can be built using VB .NET.

   b) What is toolbox ? Mention the use of toolbox.

   c) Differentiate public and private access specifiers.

   d) Differentiate On Error Resume Next and On Error Go To 0 statements.

   e) Compare MsgBox() and InputBox() functions.

   f) List any four datatypes available in VB .NET.

   g) How do you make a textbox non-editable ?

   h) What do you mean by MDI ?

   i) Differentiate open file dialog and save file dialog.

   j) List any four keyboard events.

   k) What is field-level validation ?

   l) What is connection string ?

PART – B

Answer **any one full** question from **each** Unit.

Unit – I

2. a) Explain .NET framework and common language runtime.   (5+5+5)

   b) Explain the use of properties window and solution explorer.

   c) Explain code designer and visual designer of VB.NET IDE.

P.T.O.

3. a) Explain various parts of VB IDE with diagram. (7+3+5)

   b) What is intellisense ? Explain.

   c) Explain the architecture of .NET framework with a diagram.

Unit – II

4. a) How do you create a class and an object ? Explain with syntax and
   example. (5+5+5)

   b) Differentiate sub procedure and function with syntax and example.

   c) Explain the use of SELECT CASE statement with syntax and example.

5. a) Explain the use of private, public and protected access specifiers. (5+5+5)

   b) Explain overloading and overriding with an example.

   c) Explain structured exception handling with an example.

Unit – III

6. a) Explain the following properties of a TextBox. (5+5+5)

      i) Multiline

      ii) WordWrap

      iii) PasswordChar

      iv) ReadOnly

      v) ScrollBars.

   b) Write the code for the following :

      i) Removing items from a ListBox.

      ii) Adding items

      iii) Sorting a ListBox.

      iv) Determining how many items are in a ListBox.

      v) Determining which ListBox items are selected.

   c) What is the use of scrollbar ? Explain its unique properties.

7. a) Differentiate the following :   (6+5+4)

   i) CheckBox and RadioButton

   ii) ListBox and ComboBox

   iii) Panel and GroupBox.

   b) Explain any two built in dialog boxes.

   c) How do you create a window that can accommodate child windows ? Explain.

Unit – IV

8. a) Explain any five ADO .NET objects.   (5+5+5)

   b) Write a note on Error Provider.

   c) Explain important types of validations in VB.NET.

9. a) Explain any five mouse events.   (5+5+5)

   b) Explain features of ODBC architecture.

   c) Write VB. NET code to add a record to and delete a record from the database table.

Reg. No. ☐☐☐☐☐☐☐☐

BSCCSC 357

Credit Based Sixth Semester B.Sc. Degree Examination, September 2022
(2020-21 and Earlier Batches)
COMPUTER SCIENCE
Java Programming (Elective – II)

Time : 3 Hours

Max. Marks : 80

PART – A

1. Answer **any ten** of the following : (2×10=20)

   a) What is Java Bytecode ?

   b) What is Polymorphism ?

   c) Mention any two ways of writing comments in java.

   d) How to create and instantiate a one dimensional array ? Give an example.

   e) Write the syntax to create a class in java.

   f) What is abstract class ?

   g) How to define a package ?

   h) What is the purpose of isAlive() method in case of threads ?

   i) List any four types of exceptions on java.

   j) What is an Applet ?

   k) What is an event ? Give an example.

   l) List the key items of a swing GUI.

P.T.O.

PART – B

Answer **any one full** question from **each** Unit : (4×15=60)

Unit – I

2. a) Explain console input and output operations in java.

   b) Explain primitive data types available in java.

   c) Explain switch statement with syntax and example. (5+5+5)

3. a) Explain structure of java programs with example.

   b) Explain different forms of if statement with syntax and example.

   c) Explain automatic type conversion with example. (5+6+4)

Unit – II

4. a) Explain different ways of initializing an array with an example.

   b) Explain classes and objects with suitable example.

   c) Explain the access modifiers with example. (5+5+5)

5. a) Explain command line arguments with example.

   b) Explain method overloading with an example.

   c) Explain single inheritance with example. (5+5+5)

Unit – III

6. a) Define interface. Explain how to create and implement interface with an example.

   b) Explain the purpose of synchronization.

   c) Explain any five built-in exceptions of Java. (5+5+5)

7. a) Explain different states of a thread.

   b) Explain how to create user defined exceptions in Java with example.

   c) Explain different API packages available in Java .   (5+5+5)

Unit – IV

8. a) How does an applet differ from stand-alone program ? Explain.

   b) Explain different Event Listener Interfaces.

   c) Explain the process of adding and removing components to a container.   (5+5+5)

9. a) List and explain methods defined by applet .

   b) Explain the use of JTextField and any four methods associated with it.

   c) Explain different methods associated with buttons.   (5+5+5)

_____

BSCCHC 381/BSCCHC 357

PART – B

Answer **any four** questions choosing **one** question from **each** Unit.   (15×4=60)

Unit – I

2. a) Explain free radical polymerization of vinyl polymers.   4

    b) Mention the types of matrix materials and explain any one.   4

    c) i) Explain the structure of boron nitride.   4

        ii) Explain the method of preparation of silicones.   3

3. a) Explain cationic polymerization of vinyl polymers.   3

    b) Give a method of preparation of $(NPCl_2)_3$. Explain its structure.   5

    c) i) How is silicon carbide prepared ? Mention its uses.   4

        ii) How are epoxy resins prepared ? Mention their applications.   3

Unit – II

4. a) What is photosensitization reaction ? Explain with an example.   4

    b) Explain the radiolysis of acetylene.   4

    c) i) A gaseous sample of hydrogen iodide was irradiated by light of wavelength 254 nm. When 306J of energy was found to decompose 1.3×10^{-3} mole of HI, calculate quantum yield for the decomposition of HI.   4

        ii) Mention the applications of radio isotopes.   3

5. a) State and explain law of photochemical equivalence.   3

    b) Draw Jablonsky diagram and explain different transitions.   5

    c) i) Explain Fricke dosimeter.   4

        ii) Discuss the synthesis of ammonia by radiolysis.   3

Unit – III

6. a) Explain epimerization with an example.   4

    b) How do you convert the monosaccharides into corresponding ethers and esters ?   4

    c) i) Explain the classical method of peptide synthesis.   4

        ii) Explain Strecker synthesis of α-amino acid.   3

7. a) Explain Ruff's degradation with reference to glucose. 3

   b) Explain the classifications of proteins. 5

   c) i) How is ring size of D(+) glucose determined by methylation ? 4

   ii) What is the action of heat on α-amino acids ? Give an example. 3

Unit – IV

8. a) Explain HVZ reaction with mechanism. 4

   b) How does the following react with $LiAlH_4$: (i) Acetamide (ii) Methyl acetate ? 4

   c) i) Give the method of synthesis of nicotine. 4

   ii) Write the structures of morphine and hygrine. 3

9. a) Write any two reactions of acetyl chloride. 3

   b) Explain the exhaustive methylation of alkaloids. 5

   c) i) Explain Arndt-Eistert reaction with mechanism. 4

   ii) Mention any three types of alkaloids based on their composition. Give one example for each class. 3

Time : 3 Hours

Max. Marks : 80

Instructions : 1) *Answer Part – **A** and Part – **B**.*
2) *Answer **four full** questions from Part – **B**, choosing **one full** question from **each** Unit.*
3) ***All** questions in Part – **B** carry **equal** marks.*
4) *Draw diagrams **wherever** necessary.*

PART – A

1. Answer **any ten** of the following questions :　　　　　　**(10×2=20)**

   a) Draw a labelled diagram of a starch grain. Mention any two types of starch grains.

   b) What are peroxisomes ? Mention its functions.

   c) Define cell cycle. List the stages.

   d) Draw the structure of mRNA in eukaryotes.

   e) What are Okazaki fragments ?

   f) What is transcription with respect to protein synthesis ?

   g) Why Mendel was successful in his pea-plant based genetic experiments ?

   h) Which type of interaction results in
      a) 12 : 3 : 1 and
      b) 9 : 3 : 4 phenotypic ratio ?

   i) What is test cross ? Give one example.

   j) Write the difference between spontaneous and induced mutation.

   k) What is chromosomal aberration ? Mention the types.

   l) What is the function of mitochondrial DNA ?

P.T.O.

BSCBOC 381

-2-

PART – B
Unit – I

2. a) Explain briefly about different types of excretory products in plants. 4

   b) Write a note on nucleosome model. 4

   c) Describe the structure of mitochondria with a neat labelled diagram. Add a note on its functions. 7

OR

3. a) Write about nuclear pore complex. 3

   b) Describe the structure and function of ribosome. 5

   c) Write a short note on mitosis in plant cells and its significance. 7

Unit – II

4. a) Describe gene splicing process. 4

   b) Describe clover-leaf model of tRNA. 4

   c) Explain the salient features of Watson-Crick model of DNA. 7

OR

5. a) List any 3 functions of rRNA. 3

   b) List the properties of genetic code. 5

   c) Write a note on Griffith Experiment and Avery MacLeod Experiments to prove that DNA is the genetic material. 7

Unit – III

6. a) State the :
      i) Law of segregation and
      ii) Law of independent assortment 4

   b) Define type of linkages. 4

   c) Explain multiple allelism with suitable plant example. 7

OR

7. a) Write a short note on sex determination mechanism in *Coccinea indica*. 3

   b) Explain supplementary gene interaction with an example. 5

   c) Describe Mendel's dihybrid ratio with an example. 7

Unit – IV

8. a) What is frame shift mutation ? 4

   b) Write a note on euploidy and its types. 4

   c) Give an account on deletion and duplication with their significance. 7

OR

9. a) What is ploidy ? Mention its significance. 3

   b) Write a note on chemical mutagens. 5

   c) What is extra-nuclear genome ? What are the features and functions of plasmid DNA ? 7
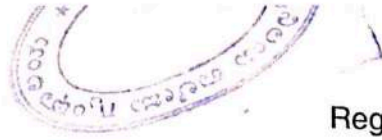
BSCBOC 382

Choice Based Credit System Sixth Semester B.Sc. Examination, September 2022
(2021-22 Batch Onwards)
BOTANY
Plant Propagation and Biotechnology

Time : 3 Hours

Max. Marks : 80

Instructions : 1) *Answer Part – **A** and Part – **B**.*

      2) *Answer **four full** questions from Part – **B** choosing **one*** *full question from **each** Unit.*

      3) ***All** questions in Part – **B** carry **equal** marks.*

      4) ***Draw** diagrams **wherever** necessary.*

PART – A

1. Answer **any ten** of the following :   (2×10=20)

  i) Define polyploidy breeding. Write any one significance of it.

  ii) Write any two objectives of plant breeding.

  iii) Name two plants propagated through root cutting.

  iv) Define cellular totipotency.

  v) What is pollen culture ?

  vi) Name and mention the role of the two important growth hormones used in plant tissue culture.

  vii) What is meant by recombinant DNA technology ?

viii) Write any two applications of transgenic plants.

ix) What is pBR 322 ?

x) Name any four types of biofertilizers.

xi) Define bioremediation.

xii) What are biofuels ?

PART – B

Unit – I

2. a) Explain air layering with an example.   4

   b) Write briefly on mutation breeding.   4

   c) Define hybridization. Name the types. Describe any one type of hybridization
      in plant breeding.   7

OR

3. a) Define male sterility. Name the types.   3

   b) Explain approach and crown grafting.   5

   c) Describe any two methods of selection in plant breeding.   7

Unit – II

4. a) Explain embryo culture.   4

   b) Write notes on applications of tissue culture in agriculture with examples. 4

   c) Explain in detail the method of preparation of any one tissue culture medium
      you have studied.   7

OR

5. a) Write a note on synthetic seeds.   3

   b) Outline the methods of sterilization in tissue culture.   5

   c) Explain the techniques of somatic hybridization.   7

BSCBOC 382

Unit – III

6. a) Write brief notes on restriction endonucleases. **4**

   b) Explain electroporation technique of gene transfer. **4**

   c) Give an account of applications and threats from transgenic plants. **7**

OR

7. a) Give the difference between cloning and expression vectors. **3**

   b) Explain the steps involved in the production of Bt cotton. **5**

   c) Give an account of tools used in genetic engineering. **7**

Unit – IV

8. a) Describe production and application of biogas. **4**

   b) Write briefly on biomining. **4**

   c) Describe anaerobic waste water treatment with examples. **7**

OR

9. a) Write short note on biofilters. **3**

   b) Give an account of biodegradable plastics. **5**

   c) What are biopesticides ? Describe their types and applications. **7**
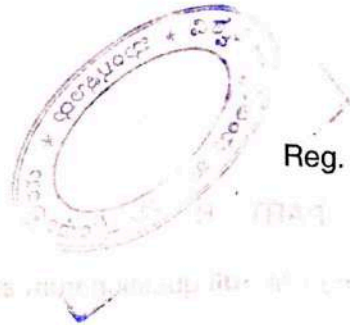
Reg. No. ☐☐☐☐☐☐☐☐

BSCMBC 382

Choice Based Credit System VI Semester B.Sc. Degree Examination, September 2022
(2021 – 22 Batch Onwards)
MICROBIOLOGY
Environmental Microbiology

Time : 3 Hours

Max. Marks : 80

Instructions : 1) *Answer both Part – **A** and Part – **B**.*
2) *Draw diagrams **wherever** necessary.*

PART – A

Answer **any ten** of the following :

(10×2=20)

1. a) Droplet nuclei

   b) COD

   c) Space microbiology

   d) Xenobiotic

   e) Allergens

   f) Sewage

   g) Halophiles

   h) Bio-mining

   i) Rotorod

   j) Water pollution

   k) Bio-venting

   l) Gulliver experiment.

BSCMBC 382

PART – B

Answer **any four** questions choosing **one full** question from **each** Unit :   (4×15=60)

Unit – I

2. a) Write a note on outdoor micro flora. 5

 b) Explain the techniques of trapping air borne micro-organisms using Anderson Air Sampler and Portor impinge. 10

OR

3. a) Write a note on fungal air borne diseases. 5

 b) Discuss air pollution in detail. 10

Unit – II

4. a) Write a note on trickling filters. 5

 b) Explain the process of water. 10

OR

5. a) Comment on any two water borne bacterial diseases. 5

 b) Give an account on sanitary quality of water. 10

Unit – III

6. a) Write a note on historical development of space microbiology. 5

 b) Give a detailed account on thermopiles and their adaptations. 10

OR

7. a) Comment on barophiles. 5

 b) Explain acidophiles and alkalophiles and note on their adaptation. 10

Unit – IV

8. a) Comment on biodegradation of petrol. 5

 b) Explain ex-situ bio-remediation in detail. 10

OR

9. a) Explain factors affecting bio-remediation. 5

 b) Discuss degradation of pesticides. 10

Time : 3 Hours

Max. Marks : 80

Note : 1) Answer both Part – **A** and Part – **B**.

2) Draw diagrams **wherever** necessary.

PART – A

1. Answer **any ten** of the following.

(10×2=20)

a) <u>Aspergillus</u> species.

b) Food additives.

c) SPC.

d) Stormy fermentation.

e) Antifoam agents.

f) Screening.

g) Impeller.

h) Amylase.

i) Buttermilk.

j) Methanogens.

k) Canning.

l) GMP.

BSCMBC 381

PART – B

Answer **any four** questions choosing **one full** question from **each** Unit.

Unit – I

2. a) Write a note on 'Food as substrate for microbes'.   **5**

   b) Explain the various factors influencing the microbial growth in food.   **10**

   OR

3. a) Give a general account of HACCP.   **5**

   b) Define food spoilage. Write in detail the physical methods of food preservation.   **10**

Unit – II

4. a) Write a note on the microflora of raw milk.   **5**

   b) What are the methods of milk examination ? Write briefly on the reductase tests of milk.   **10**

   OR

5. a) Write briefly on the biochemical activities of microbes in the milk.   **5**

   b) Explain the industrial production of cheese in detail.   **10**

Unit – III

6. a) Write briefly on the sterilization of fermenter.   **5**

   b) Explain the methods of 'Strain Improvement' of industrially important microbes.   **10**

   OR

7. a) Write a note on the media used in industrial fermentations.   **5**

   b) What is a fermenter ? Draw a well labelled diagram of a typical fermenter. Explain.   **10**

Unit – IV

8. a) Explain the industrial production of Gibberellins.   **5**

   b) Explain in detail the industrial production of Penicillin.   **10**

   OR

9. a) What are the types of wines ? Draw the flow chart of wine production.   **5**

   b) Explain in detail the industrial production of proteases.   **10**

PART – A

1. Answer **any ten** of the following questions :

(10×2=20)

a) Mention the four types of applications can be developed in .NET framework.

b) What is an assembly ? Write its use.

c) Write the use of With statement with example.

d) What do you mean by Intellisence ?

e) Differentiate between sub procedures and function procedures.

f) Write the purpose of Finally keyword.

g) Mention four values of FormBorderstyle property.

h) Write the most commonly used properties of a timer control along with its purpose.

i) Differentiate between check boxes and radio buttons.

j) How to add access key to menu items in menustrip control?

k) What is data adapter? Mention most commonly used method of a data adapter.

l) Write the use of command object.

BSCCSC 382

-2-

PART – B

Answer **any one** full question from **each** unit.

Unit – I

2. a) What are solutions and projects? Explain the types of projects in .NET.

   b) What are namespaces? Explain any four system namespaces.

   c) Explain different forms of if statement with example. **(5+5+5)**

3. a) Explain the purpose of Public and Private keywords with example.

   b) Explain Select Case statement with syntax and example.

   c) Write a note on .Net Framework and Common Language Runtime. **(5+5+5)**

Unit – II

4. a) What are procedures ? Explain the types of procedures used in VB.NET with example.

   b) What is exception ? Explain structured exception handling with example.

   c) Explain any five commonly used properties of a form. **(5+5+5)**

5. a) Explain any five mouse events.

   b) What is scope of a variable ? Explain the different scopes of a variable in VB.NET.

   c) Explain InputBox() and MsgBox() functions with example. **(5+5+5)**

Unit – III

6. a) Differentiate the following:

   i) Radio button and Check box

   ii) List box and Combo box

   iii) Label and Text box

   iv) Progress bar and Scroll bar

   v) Group box and Panel.

   b) Explain Maximum, Minimum, SmallChange, LargeChange and Value properties of a Scroll bar controls.

   c) Explain commonly used properties and events of a list box. **(5+5+5)**

7. a) Explain the following :

   i) BorderStyle property of a text box

   ii) Autosize property of picture box

   iii) Interval property of a Timer Control

   iv) Text property of a Combo box

   v) Backcolor property of a form.

   b) Explain cut, copy and paste clipboard operations in VB.NET with example.

   c) Explain Multiline, Scrollbar, Wordwrap, Readonly and PasswordChar
   properties of a text box.   **(5+5+5)**

Unit – IV

8. a) Explain any five ADO.NET objects.

   b) Explain the ways to use data binding in VB .NET applications.

   c) What is context menu ? How do you create it ?   **(5+6+4)**

9. a) Explain about any two built-in dialog boxes.

   b) What are the different ways of navigating through the data sets ?
   Explain.

   c) Write a note on data validation in controls.   **(5+6+4)**

_____

Reg. No. ☐☐☐☐☐☐☐☐☐

BSCCSC 381

Choice Based Credit System Sixth Semester B.Sc. Degree
Examination, September 2022
COMPUTER SCIENCE
Object Oriented Programming with Java
(2021 – 22 Batch Onwards)

Time : 3 Hours   Max. Marks : 80

Note : *Answer* **any ten** *questions from Part –* **A** *and* **one full** *question from* **each** *Unit of Part –* **B**.

PART – A   (10×2=20)

1. a) List any four benefits of OOP.

   b) Write the meaning of System.out.println().

   c) What is dynamic initialization of variables ? Give example.

   d) What are classes and objects ?

   e) List and write the purpose of any two string methods.

   f) What is the purpose of finalize() in java ?

   g) What are abstract classes? Give example.

   h) List and write the purpose of any two built in exceptions.

   i) What are final variables ?

   j) What is the purpose of wait() and notifyAll() ?

   k) What is an applet ?

   l) What is the purpose of update() in applet ?

PART – B

Unit – I

2. a) Write any five differences between java and C.

   b) Explain labelled loops with suitable example.

   c) Explain different basic data types available in java.   (5+5+5)

P.T.O.

BSCCSC 381

3. a) Explain different features of java.
   b) List and explain arithmetic and logical operators in java.
   c) Write a note on java streams.   **(4+6+5)**

Unit – II

4. a) Explain different access modifiers in java.
   b) Explain how to pass variable length arguments with suitable example.
   c) What is constructor ? Explain with example.   **(5+5+5)**

5. a) Explain the use of static methods with example.
   b) Explain method overloading with suitable example.
   c) What are arrays ? Explain how to declare, initialize and access one
      dimensional array with example.   **(5+5+5)**

Unit – III

6. a) Explain single inheritance with example.
   b) Illustrate the use of finally with suitable example.
   c) Explain how to create and use a package in Java with example.   **(5+5+5)**

7. a) Explain exception handling in Java with suitable example.
   b) List and explain different API packages available in java.
   c) Explain method overriding with suitable example. **(5+5+5)**

Unit – IV

8. a) Explain the process of creating a thread by implementing Runnable interface
      with suitable example.
   b) Explain how to pass parameters to an Applet with suitable example.
   c) List and explain any five thread methods.   **(5+5+5)**

9. a) Write the complete Applet skeleton.
   b) Write a note on thread priority.
   c) List and explain the components of Delegation Event Model.   **(5+5+5)**
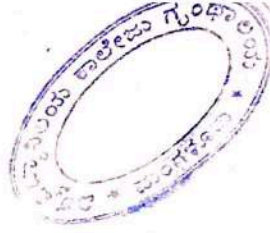
Reg. No. ☐☐☐☐☐☐☐☐

BSCMTC 381

**Choice Based Credit System VI Semester B.Sc. Degree
Examination, September 2022
MATHEMATICS
Paper – VII : Numerical Analysis
(2021-22 Batch Onwards)**

Time : 3 Hours

Max. Marks : 80

Instructions : 1) Answer **any ten** questions from Part – **A**. **Each** question carries **2** marks.
2) Answers to Part – **A** should be written in the **first** few pages of the answer book before answers to Part – **B**.
3) Answer **twelve** questions from Part – **B**. **Each** question carries **5** marks.
4) Scientific calculators are **allowed**.

PART – A

(10×2=20)

1. Round off the number 48.21416 to two decimal places and find absolute error.

2. Find the relative error of the number 8.6 if both of its digits are correct.

3. Find an interval in which the equation $x^3 + x^2 - 1 = 0$ has a real root.

4. What is the condition on $\Phi(x)$ in the method of iteration given by $x_{n+1} = \Phi(x_n)$?

5. If $f(x) = a_0 x^n + a_1 x^{n-1} + \ldots + a_n$ is a polynomial of degree n, then what is its $(n+1)^{th}$ difference ?

6. Evaluate $\Delta^2 (x^3)$ where the interval of differencing is unity.

7. Write Newton's backward interpolation formula.

8. Construct the divided difference table for the following table.

x	−1	0	3	6
y	3	−6	39	822

P.T.O.

15. Use Taylor series method to find y(0.1) for the initial value problem $y^1 = x - y^2$ subject to the condition y(0) = 1.

16. Using modified Euler's method, find the value of y when x = 0.1 given that $\frac{dy}{dx} = x^2 + y$ with y(0) = 1, by taking h = 0.1.

17. Use Runge–Kutta method of order four to find y(0.2) for $\frac{dy}{dx} = 1 + y^2$ and y(0) = 0 by taking h = 0.2.

18. Given $\frac{dy}{dx} = 1 + y^2$ and y(0) = 0, y(0.2) = 0.2027, y(0.4) = 0.4228, and y(0.6) = 0.6841 compute y(0.8) using predictor-corrector method.

———————
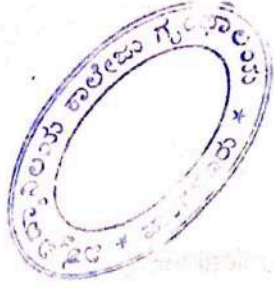
Reg. No. ☐☐☐☐☐☐☐☐

BSCMTC 383

Choice Based Credit System VI Semester B.Sc. Examination, September 2022
(2021 – 22 Batch Onwards)
MATHEMATICS (Special Paper)
Linear Programming (Paper – VIII (b))

Time : 3 Hours   Max. Marks : 80

Instructions : 1) Answer **any ten** questions from Part – **A**. **Each** question carries **2** marks.
2) Answers to Part – **A** should be written in the first few pages of the answer book before answers to Part – **B**.
3) Answer **twelve** questions from Part – **B**. **Each** question carries **5** marks.
4) Scientific calculators are **allowed**.

PART – A

I. Answer **any ten** questions :   (10×2=20)

1) Define a line segment in $\mathbb{R}^n$.

2) Pivot on $a_{11} = 2$ in the following canonical maximum table.

x	y	−1	
2	3	6	$= -t_1$
1	3	2	$= -t_2$
0	2	1	$= f$

3) State the canonical maximization LPP represented by

x	y	−1	
1	2	3	$= -t_1$
4	5	6	$= -t_2$
7	8	9	$= f$

P.T.O.

4) Convert the following LPP to canonical form.

Maximize : $f(x, y) = x + y$
Subject to $x - y \leq 3$
$\qquad\qquad 2x + y \geq 1$
$\qquad\qquad 0 \leq x \leq 4$
$\qquad\qquad y \geq 0.$

5) Write the tucker tableau of the canonical maximization LPP.

Maximize : $f(x, y) = x$
Subject to $x + y \leq 1$
$\qquad\qquad x - y \geq 1$
$\qquad\qquad y - 2x \geq 1$
$\qquad\qquad x, y \geq 0.$

6) Write the maximum table taking the negative transpose of the minimum table.

X_1	1	3	6
X_2	2	4	5
-1	8	7	0
	$= t_1$	$= t_2$	$= g$

7) Given the LPP below :

Maximize : $f(x_1, x_2) = x_1 + x_2$
Subject to $x_1 + 2x_2 \leq 4$
$\qquad\qquad 3x_1 + x_2 \leq 6$
$\qquad\qquad x_1, x_2 \geq 0$

State the dual canonical minimization LPP.

8) Write the matrix reformulation of canonical maximization LPP.

9) Reduce the table of the matrix game.

$$\begin{bmatrix} -1 & 1 & -1 & 2 \\ -1 & -1 & 1 & 1 \\ 0 & 1 & 1 & -1 \end{bmatrix}$$

using domination.

10) Define mixed strategy and pure strategy for row player in the matrix game.

11) State the general balanced transportation problem.

12) Explain the process of converting an unbalanced transportation problem to a balanced transportation problem when supply is more than the demand.

13) Find two permutation set of zeros in the following table of balanced assignment problem.

0	0	1
0	0	0
1	0	0

14) Construct a cycle using circled cells in the following table.

$\textcircled{C_{11}}$	$\textcircled{C_{12}}$	C_{13}
C_{21}	$\textcircled{C_{22}}$	$\textcircled{C_{23}}$
$\textcircled{C_{31}}$	C_{32}	$\textcircled{C_{33}}$

BSCMTC 383

PART – B

(12×5=60)

II. Answer **any twelve** questions :

1) An appliance company manufactures heaters and airconditioners. The production of one heater requires 2 hours in the parts division of the company and 1 hour in the assembly division of the company. The production of one air-condition requires 1 hour in the parts division of the company and 2 hours in the assembly division of the company. The parts division is operated for atmost 8 hours per day and the assembly division is operated for atmost 10 hours per day. If the profit realized upon sale is $ 30 per heater and $ 50 per air-conditioner, how many heaters and air-conditioners should the company manufacture per day so as to maximize profits ? Solve graphically.

2) Apply the simplex algorithm to the maximum tableau.

x_1	x_2	−1	
−1	−1	−3	$= -t_1$
1	2	2	$= -t_2$
2	−4	0	$= f$

3) Solve using the simplex algorithm.

x	y	−1	
−1	−1	−2	$= -t_1$
1	−2	0	$= -t_2$
2	1	1	$= -t_3$
−1	3	0	$= f$

4) Solve :

Maximize : $f(x, y) = x + 3y$

Subject to $x + 2y \leq 10$

$\qquad 3x + y \leq 15$

5) Solve :

Maximize : $f(x, y, z) = x + 2y + z$

Subject to $x + y + z = 6$

$\qquad x + y \leq 1$

$\qquad x, z \geq 0$

6) For any pair of feasible solutions of dual canonical LPP's, prove that

$g - f = SX' + Y'T$.

7) Solve the dual canonical LPP below.

	x_1	x_2	-1	
y_1	-1	1	-1	$= -t_1$
y_2	1	-1	-1	$= -t_2$
-1	1	1	0	$= f$
	$= s_1$	$= s_2$	$= g$	

8) Solve the dual canonical LPP below :

	x_1	x_2	-1	
y_1	1	-1	-1	$= -t_1$
y_2	-1	-1	-1	$= -t_2$
-1	1	-2	0	$= f$
	$= s_1$	$= s_2$	$= g$	

9) Solve the dual non-canonical LPP below.

	x_1	x_2	x_3	-1	
y_1	1	-1	2	1	$= -o$
y_2	2	0	2	-1	$= -t_1$
y_3	0	1	-1	-1	$= -t_2$
-1	1	-1	3	0	$= f$
	$= o$	$= o$	$= s_1$	$= g$	

10) Solve the dual non-canonical LPP.

	x_1	x_2	-1	
y_1	2	-1	-1	$= -o$
y_2	-1	1	-1	$= -t_1$
-1	2	1	0	$= f$
	$= o$	$= s_2$	$= g$	

11) Find the optimal strategies for the row and column players and the Von-Neumann value of the matrix game.

$$\begin{bmatrix} -\dfrac{5}{3} & 0 \\ 5 & \dfrac{-10}{3} \end{bmatrix}$$

12) Solve the matrix game.

$$\begin{bmatrix} -3 & 4 \\ 2 & -3 \end{bmatrix}$$

13) State the transportation algorithm.

14) Solve the transportation problem below.

5	12	8	50	26
11	4	10	8	20
14	50	1	9	30
15	20	26	15	

15) Solve the transportation problem below.

2	1	2	50
9	4	7	70
1	2	9	20
40	50	20	

16) State the Hungarion algorithm to solve a balanced assignment problem.

17) Solve the assignment problem.

	J_1	J_2	J_3
P_1	8	7	10
P_2	7	7	8
P_3	8	5	7

18) Explain Hungarian Algorithm of solving assignment problem.

———————

BSCPHC 382

Choice Based Credit System VI Semester B.Sc.
Degree Examination, September 2022
(2021 – 22 Batch Onwards)
PHYSICS
Electronics

Time : 3 Hours

Max. Marks : 80

Instructions : i) Answer questions from **all** Units.
ii) Scientific calculators are allowed.

PART – A

1. Answer **any 8** questions. $(8 \times 1 = 8)$

   i) What is Supply Voltage Rejection Ratio (SVRR) in an OPAMP ?

   ii) What is positive feedback in a circuit ?

   iii) What is the use of Pin. No. 8 in an OPAMP ?

   iv) How many outputs will be there for a binary adder ?

   v) Give the Boolean expression for the output of a two input NOR gate.

   vi) Give an example for a universal gate.

   vii) The modulating frequency of AM wave is f_m. What is its bandwidth ?

   viii) How many sidebands will be present in FM wave ?

   ix) What is skip distance in ionospheric communication ?

2. Answer **any 6** questions. $(2 \times 6 = 12)$

   i) The CMRR of an OPAMP is 10^4. If common mode gain is 10, find differential mode gain.

   ii) State Barkhausen criteria for an oscillator.

   iii) What is a filter ? Name any two filters.

   iv) Realize OR gate using NAND gates.

   v) Write the truth table for two input NOR gate.

P.T.O.

vi) Write the logic diagram for Boolean expression $Y = \overline{AB} + A$, using basic logic gates.

vii) Mention any two advantages of diode detector.

viii) Mention any two limitations of AM.

ix) Give any two comparisons between LED and LCD monitors.

PART – B

Unit – I

3. a) Explain input offset voltage, input offset current and CMRR of an OPAMP.   **3**

   b) Explain the action of capacitor filter with required diagram.   **5**

   c) Derive an expression for voltage gain of a feedback amplifier in terms of feedback fraction. Explain the action of transistor phase shift oscillator with a circuit diagram.   **8**

OR

4. a) Give any three differences between positive and negative feedback in electrical circuit.   **3**

   b) Explain OPAMP inverting amplifier and obtain expression for its gain.   **5**

   c) Explain the working of full wave bridge rectifier with required diagram. What is ripple factor ? Show that ripple factor is 0.482 for a bridge rectifier.   **8**

5. a) For a zener regulator, $V_z = 10$ V, $R_s = 1$ KΩ, $R_L = 2$ KΩ and the input voltage varies from 20 to 50 V. Find the maximum and minimum values of zener current.   **4**

OR

   b) An amplifier without feedback has an output of 45 V for an input of 0.05 V. If 1% negative feedback is applied, what is the output voltage ?   **4**

Unit – II

6. a) Explain the working of NOT gate using discrete circuit.   **3**

   b) State and explain De-Morgan's theorems.   **5**

   c) What is a counter ? Explain the working of ripple counter using JK Flip-Flops and write the timing diagram.   **8**

OR

7. a) Write the logic diagram, truth table and symbol of a JK Flip-Flop. **3**

   b) Explain XOR gate using basic logic gates with its logic diagram and truth table. **5**

   c) Explain the sum of products method for the simplification of Boolean expression with an example. **8**

8. a) Simplify Boolean expression $Y = ABC + A\overline{B}C + A\overline{B}\overline{C}$ and draw the logic diagram for simplified expression. **4**

   OR

   b) Prove (i) $(A + B)(A + C) = A + BC$ (ii) $(\overline{A} + B)(A + B) = B$. **4**

Unit – III

9. a) Write a note on classification of radio waves on the basis of modes of propagation. **3**

   b) Describe AM radio transmitter with a block diagram. **5**

   c) With required wave diagrams obtain an expression for AM wave. Mention any three advantages of SSB transmission. **8**

   OR

10. a) Give any three comparisons of AM and FM. **3**

    b) Explain the working of linear diode detector showing wave forms at different blocks. **5**

    c) With neat labelled diagram, explain the working of Cathode ray tube. Mention any three uses of CRO. **8**

11. a) The maximum and minimum peak to peak voltages of an AM wave are 16 mV and 4 mV respectively. Calculate modulation index. If the carrier power is 5 KW, find the total power. **4**

    OR

    b) What are carrier, sideband and total power in an AM wave across a load of 100 Ω, when the carrier voltage is 100 V and modulation index is 0.5. **4**
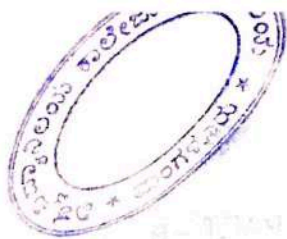
Reg. No. ☐☐☐☐☐☐☐☐

BSCPHC 381

Choice Based Credit System Sixth Semester B.Sc. Degree
Examination, September 2022
(2021 – 22 Batch Onwards)
PHYSICS
Nuclear Physics

Time : 3 Hours   Max. Marks : 80

Instructions : i) Answer questions from **all** Units.
                    ii) Scientific calculators are **allowed**.

PART – A

1. Answer **any eight** of the following questions :   (1×8=8)
   i) What is threshold energy of a nuclear reaction ?
   ii) What is radioactive series ?
   iii) What is radio carbon dating ?
   iv) What are nuclear forces ?
   v) What is a chain reaction ?
   vi) What is stellar energy ?
   vii) What are quarks ?
   viii) Write the necessary condition for the working of cyclotron.
   ix) What are hard cosmic rays ?

2. Answer **any six** of the following questions :   (2×6=12)
   i) What is the significance of Q value of a nuclear reaction ?
   ii) What is K-electron capture ? Explain.
   iii) Define curie and becquerel.
   iv) Explain nuclear fission with an example.
   v) What are magic numbers ? Mention them.
   vi) Write any two drawbacks of liquid drop model.
   vii) What is quenching ? Name the compound used in organic quenching.
   viii) Write the decay scheme of μ^+ and μ^- particles.
   ix) Write any two advantages of cyclotron.

P.T.O.

PART – B
Unit – I

3. a) Explain the interactions of gamma rays with matter. 3

   b) What is an endoergic reaction ? Deduce the expression for the threshold energy of an endoergic reaction. 5

   c) With elements A, B and C forming a radioactive series (C being stable), derive an expression for the number of atoms of B if at start B was not present in the sample. 8

OR

4. a) What is tunnel effect ? Quantitatively account for tunnel effect. 3

   b) What is beta ray spectra ? Explain any four paradoxes of beta ray spectra. 5

   c) Discuss the experiment leading to the discovery of neutrons. Explain any four properties of neutrons. 8

5. a) A carbon specimen found in excavation contain 1/8 as much ^{14}C as an equal amount of carbon in living matter. Calculate the approximate age of the specimen. Half life of ^{14}C = 5568 years. 4

OR

   b) Calculate the threshold energy required to initiate the reaction ^{31}P(n, p) ^{31}Si. Given atomic masses $^{1}_{1}$H = 1.00814 amu, neutron = 1.00895 amu. $^{31}_{15}$P = 30.98356 amu and $^{31}_{14}$Si = 30.98514 amu. 4

Unit – II

6. a) Explain Yukawa's meson field theory. 3

   b) Derive four factor formula for a nuclear reactor. 5

   c) Describe with theory the working of dempster's mass spectrograph and explain how isotopic abundances can be determined. 8

OR

7. a) Explain C-N cycle of fusion in stars. 3

   b) Write any five properties of nuclear forces. 5

   c) With a neat and labelled diagram, explain the working of a nuclear reactor. 8

8. a) An alpha particle of energy 5 MeV approaches the gold nucleus with an impact parameter 2.6×10^{-13}m. Through what angle will it be scattered ? The atomic number of gold is 79.

4

OR

b) A city requires 100 MW of electrical power per day which is supplied by a nuclear reactor of efficiency 40%. Calculate the amount of U – 235 fuel required per day of operation. (Assume the average energy of 200 MeV released per fission).

4

Unit – III

9. a) Write a note on origin of cosmic rays.

3

b) Describe the working of GM tube with the necessary diagram.

5

c) Explain the principle of a betatron. Hence derive an expression for the final energy gained by the electrons.

8

OR

10. a) Write a note on Van allen radiation belts.

3

b) Explain the variation of cosmic ray intensity with :

i) Altitude and

ii) East-west direction.

5

c) Explain the condition for synchronisation in a linear accelerator and obtain the expression for the maximum energy of the particles ejected from the accelerator.

8

11. a) The radius of cyclotron DEE is 0.4 m and the applied magnetic field is 1.5 Wb/m². What is the maximum energy of a beam of protons ?
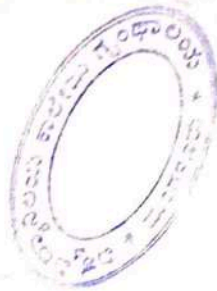Given : Mass of proton = 1.67×10^{-27} kg.

4

OR

b) Electrons are accelerated in a betatron working at 50 Hz frequency and has a stable orbit of radius 2 meter having the magnetic field strength 5T at the orbit. Calculate the average energy per revolution gained by the particles. (Express the energy in eV). Assume electrons are moving with velocity C.

4

Reg. No. ☐☐☐☐☐☐☐

BSCZOC 381

Choice Based Credit System Sixth Semester B.Sc. Degree Examination, September 2022
(Semester Scheme) (2021-22 Batch Onwards)
ZOOLOGY – VII
Reproductive Biology and Developmental Biology

Time : 3 Hours

Max. Marks : 80

Instruction : *Draw diagrams* **wherever** *necessary.*

PART – A

I. Answer **any ten** questions. (10×2=20)

a) Name any two accessory male reproductive glands.

b) Define spermiogenesis.

c) Expand ZIFT and GIFT.

d) What is ovoviviparity ? Give an example.

e) Define capacitation.

f) Name any two types of blastula.

g) What is embryonic induction ?

h) What is notogenesis ?

i) Name two nutritive substances in hen's egg.

j) Name any two types of placenta based on distribution of villi.

k) Write the functions of amnion.

l) Name any two hormones secreted by ovary.

PART – B
Unit – I

II. Answer **any two** questions. (4×2=8)

a) Write a note on secondary sexual characters in Humans.

b) Write a note on menstrual cycle in human.

c) Briefly explain previtellogenesis.

P.T.O.

BSCZOC 381

Answer **any one** question.   (7×1=7)

   a) Define parthenogenesis. Explain diploid parthenogenesis with suitable examples.

   b) Briefly explain :

      i) IVF and ET

      ii) Superovulation.

Unit – II

IV. Answer **any two** questions.   (4×2=8)

   a) Explain the types of eggs based on the amount of yolk.

   b) Write a note on acrosome reaction and sperm penetration.

   c) Define kinds of fertilization with suitable examples.

V. Answer **any one** question.   (7×1=7)

   a) Explain patterns of cleavage with suitable illustrations.

   b) Write a note on theories of development.

Unit – III

VI. Answer **any two** questions.   (4×2=8)

   a) Briefly explain experiment of Spemann and Mangold.

   b) Write a note on cleavage in frog.

   c) Explain Brachet's experiment.

VII. Answer **any one** question.   (7×1=7)

   a) Explain the fate map of frog with a neat labelled diagram.

   b) Write a neat labelled diagram of hen's egg and explain.

Unit – IV

VIII. Answer **any two** questions.   (4×2=8)

   a) Explain the structure of human blastocyst.

   b) Briefly explain development, structure and functions of allantois.

   c) Write a note on hormones of placenta and their functions.

IX. Answer **any one** question.   (7×1=7)

   a) Briefly explain histological classification of placenta with examples.

   b) Write a neat labelled diagram of mature sperm and explain.

———————

Reg. No.
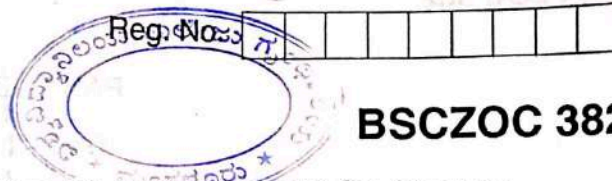
BSCZOC 382

Choice Based Credit System Sixth Semester B.Sc. Degree Examination, September 2022
(Semester Scheme) (2021 – 22 Batch Onwards)
ZOOLOGY – VIII
Environmental Biology and Wildlife Biology

Time : 3 Hours   Max. Marks : 80

*Instruction : Draw diagrams **wherever** necessary.*

PART – A

I. Answer **any ten** questions.   (10×2=20)

a) What is autecology and synecology ?

b) Define cyclomorphosis.

c) What is mutualism ? Give two examples.

d) What is biotic potential ?

e) What are community structure ?

f) What are ecological pyramids ? Name any two types.

g) What are bioindicators ? Give examples.

h) What is Kyoto protocol ?

i) What is toxicology ? Enumerate any two subdivisions of toxicology.

j) Write the advantages of nuclear power plant.

k) What is discontinuous distribution of animals ? Give two examples.

l) Expand CITES and CBD.

P.T.O.

PART – B

Unit – I

II. Answer **any two** questions.   (4×2=8)

   a) Write a note on ecological niches.

   b) Explain the effect of light on animals.

   c) Draw a neat labelled diagram showing zonation of the sea.

III. Answer **any one** question.   (7×1=7)

   a) Write an explanatory notes on :

      i) Competition

      ii) Ammensalism.

   b) What is biome ? Explain any two biomes.

Unit – II

IV. Answer **any two** questions.   (4×2=8)

   a) Write an explanatory note on Allee's principle.

   b) Explain the term ecotone and edge effect with example.

   c) Write notes on alpha, beta and gamma diversity.

V. Answer **any one** question.   (7×1=7)

   a) Write explanatory note on :

      i) Man engineered ecosystem

      ii) Food web.

   b) Explain nitrogen cycle with an illustration.

Unit – III

VI. Answer **any two** questions.   (4×2=8)

   a) Write a note on electrostatic precipitators and cyclone separators.

   b) Explain the effects of global warming.

   c) Explain any four factors influencing toxicity.