(For Reappear Candidates Only 2022-23)

Exam Code: 121301 **Paper Code: 9142**

Programme: Bachelor of Science (Semester-I)
Course Title: Chemistry (Inorganic Chemistry)
Course Code: BSMM/BSNM-1084 (I)

Time Allowed: 3 hours **Max Marks: 30**

Note: -- Attempt **five** Questions in all, selecting at least **one** question from each section. The **fifth** question can be attempted from any Section. Each question carries equal (6) marks.

SECTION-A

1. (a) Formulate the Schrodinger Wave equation for one electron atomic system in three dimensions from equation $\Psi = A \sin 2\pi x/\lambda$. (4)
   (b) What are the conditions that must be fulfilled by the Ψ for acceptable solution? (2)
2. (a) Calculate de Broglie wavelength of an electron moving with a velocity of 10^9 cm/s. Mass of the electron is $9.11 * 10^{-31}$ Kg. (3)
   (b) Show diagrammatically how many nodes are present in each of the following:
   (i) 3s-orbital (ii) 2p-orbital (iii) 3d-orbital (3)

SECTION-B

3. (a) What is ionization energy? Discuss various factors that affect Ionisation energy? (3)
   (b) Using Slater's rule; find out the screening constant and then the effective nuclear charge for an 3d-electron in zinc (Z=30)? (3)
4. (a) What is electron affinity? Which has the largest electron affinity F or Cl? Explain why?
   (b) Discuss Pauling Scale of electronegativity in detail? (3)

SECTION-C

5. (a) Define Hybridisation. On the basis of hybridization discuss the shape of BeF_2? (3)
   (b) What are electron deficient compounds. Discuss in detail the structure of diborane? (3)

6. (a) How will you account for the smaller bond order of NO as compared to NO^+, on the basis of molecular orbital theory? (3)
   (b) Explain the structure of PF_5 and SF_6 molecule on the basis of VSEPR theory. (3)

SECTION-D

7. (a) What is Radius ratio rule. Discuss in detail radius ratio for tetrahedral site? (4)
   (b) What is Fajan's Rule. How does it help in predicting the covalent character in a bond? (2)
8. (a) Discuss and draw the structure of NaCl and ZnS (Zinc Blende). Write the differences between the two. (4)
   (b) What is meant by n-type and p-type semiconductors? (2)

Exam Code: 121301 **Paper Code: 1185**

Programme: Bachelor of Science (Semester: I)

Course Title: Chemistry (Inorganic Chemistry – I: Atomic Structure and Periodic Table)

Course Code: BSML/BSNL-1084

Time Allowed: 3 Hours **Max Marks: 70**

Note: Attempt five questions in all, selecting atleast one question from each section. The fifth question may be attempted from any section. Each question carries 14 marks.

Section-A

1. a) Deduce the Schrodinger wave equation for an electron moving in three dimensions.

   b) Show diagrammatically/graphically how many nodes are present in each of the following orbitals:

   (i) 1s (ii) 2s (iii) 3s (iv) 3p

(7, 7)

2. a) What is ionisation energy? Discuss the factors which affect ionisation energy and give its variation in a period and in a group in the periodic table.

   b) What is effective nuclear charge? Calculate screening constant and effective nuclear charge for its 4s and 3d electron of Zn.

(7, 7)

Section-B

3. a) Draw MO diagram of NO and show its bond order. Compare the bond length of NO with that of NO^+.

   b) Explain the structure of NH_3 molecule on the basis of VBT and hybridization.

(7, 7)

4. (a) Draw and discuss the structures of NaCl and CsCl. Show the coordination around each type of ion in these structures? What is the basic difference in these two types of structures?

(b) Construct the Born-Haber cycle for the formation of KCl. How does it explain the stability of ionic compounds?

(7, 7)

Section-C

5. (a) How is $BeCl_2$ prepared? Draw the structure of $BeCl_2$ in solid state and in the vapour state?

(b) Explain: Li forms normal oxide, Na peroxide and K, Rb and Cs the superoxides.

(7, 7)

6 (a) Discuss Lux-Flood theory for acids and bases with suitable examples.

(b) What are conjugate acid- base pairs? Why strong Bronsted acid has weak conjugate base and vice versa?

(7, 7)

Section-D

7. (a) Give one preparation of diborane. Explain the structure of diborane on the basis of hybridisation.

(b) What do you understand by back bonding? Why $N(SiH_3)_3$ is trigonal planar, but $N(CH_3)_3$ is pyramidal?

(7, 7)

8. (a) What is Inorganic benzene? Explain its structure.

(b) Why CO_2 is a gas whereas SiO_2 is a solid. Explain in detail.

(7, 7)

(For Reappear Candidates Only (2022-23))

Exam Code: 121301 **Paper Code: 9143**

Programme: Bachelor of Science (Semester-I)
Course Title: Chemistry (Organic Chemistry)
Course Code: BSMM/BSNM-1084(II)

Time Allowed: 3 Hours **Max Marks: 30**

Note: Attempt five questions in all, selecting atleast one question from each section. Fifth question can be attempted from any section. Each question carries equal (6) marks.

SECTION-A

1. (a) Describe the Average Electron Theory used to determine formal charges on various atoms within a molecule. Illustrate your explanation with a justified example, using the methyl carbocation. (3)

   (b) How does resonance help in explaining relative acid strength of phenols and alcohols. (3)

2. (a) Give the main points of difference between inductive effect and electromeric effect. (3)

   (b) Compare singlet and triplet carbenes. Explain why triplet carbenes are more stable than singlet carbenes, with a detailed discussion of their orbital structures. (3)

SECTION-B

3. (a) Bromine is less reactive but more selective whereas chlorine is more reactive but less selective. Explain. (3)

   (b) Discuss the mechanism of hydrogenation of alkenes and explain how heat of hydrogenation can be used to explain the stability of alkenes. (3)

4. (a) Explain the Wurtz reaction and its mechanism. Can this method be used for synthesizing unsymmetrical alkanes? If not, provide a reason for its unsuitability. (3)

   (b) Dehydration of 1-butanol and 2-butanol give the same mixture of alkenes. (3)

SECTION-C

5. (a) Explain Baeyer's strain theory in brief. How does it account for the reactivity of cyclopropane and cyclobutane rings? Also, discuss the limitations of this theory. (3)

   (b) Justify that SN_2 reactions proceeds with inversion of configuration. (3)

6. (a) Give the elimination-addition mechanism of aryl halides taking the example of conversion of chlorobenzene into aniline. (3)

   (b) Give a brief explanation of the Sachse-Mohr theory of strainless rings. How does this theory explain the stability of cycloalkanes with six or more carbon atoms? (3)

SECTION-D

7. (a) Define the term aromaticity. How is it related to Huckel rule. (3)

   (b) Discuss the mechanism of the following reaction (3)

$$C_6H_6 + HNO_3 \xrightarrow{H_2SO_4}$$

8. (a) Explain meta directing nature of nitro group. (3)

   (b) What do σ and π complexes refer to? How do they contribute to aromatic electrophilic substitution reactions? Explain with the help of an energy profile diagram. (3)

Exam Code:121301 **Paper Code: 1187**

Programme: Bachelor of Science
Semester- I
Course Title: Physics (Electricity and Magnetism)
Course Code: BSNL/BCSL-1395

Time Allowed:3 hrs Maximum Marks: **70**

Serial no.	Space for instructions to the candidates	Marks
	Attempt 5 questions selecting one from each section. The fifth question can be attempted from any section. All questions carry equal marks.(14)	
	Section A	
1	(a) What do you mean by gradient of a scalar quantity? Give its physical interpretation.	10
	(b) If $\phi = e^{xyz}$, calculate the gradient of ϕ at the point (1,-1,1).	4
2	(a) State and prove the Gauss divergence theorem.	7
	(b) Determine the electric field due to uniformly charged infinite wire.	7
	Section B	
3	(a) State and prove Stoke's theorem.	10
	(b) Electric potential at a point is given by $V= x^2y+ 2z$. what are the components of electric field at that point?	4
4	Determine the electric potential due to an arbitrary charge distribution and express it in terms of multipole moments.	14

	Section C	
5	What is electric image? Find the electric potential and electric field due to a point charge placed near an infinitely conducting sheet.	14
6	(a) Distinguish between current and current density. Derive a relation which connect them.	4
	(b) Derive the microscopic form of Ohm's law and explain its limitation.	10
	Section D	
7	Derive the expressions for Maxwell's equations.	14
8	Discuss in detail the behaviour of various substances in the magnetic field.	14

(Old Syllabus (2023-24))

Exam Code: 121301 **Paper Code: 9148**

Programme: Bachelor of Science (Semester-I)
Course Title: Physics (Electricity and Magnetism)
Course Code: BSNM-1395 (II), BCSM-1395 (II)

Time Allowed: 3 Hours **Max Marks: 40**

Note: Attempt five questions in all, selecting at least one question from each section. The fifth question can be attempted from any Section. Each question carries **8 marks.** Students can use Non-Scientific calculators or logarithmic tables.

Section A

1. Calculate the electric field due to uniformly charged disc having surface charge density σ at a point on the axis of disc. What form does the expression for the electric field assume if the sheet is infinite? (8)

2. (a) Given a vector $\vec{r} = x\hat{\imath} + y\hat{\jmath} + z\hat{k}$, show that $\nabla(\frac{1}{r^3}) = \frac{-3\vec{r}}{r^5}$ (3)

(b) Show that the gradient of a scalar field $\varphi(\vec{r})$ at any point is a vector field of magnitude equal to the maximum rate of change of $\varphi(\vec{r})$ in the direction along which the rate of change is most rapid. (5)

Section B

3. (a) Show that the line integral of a vector field around any closed curve is equal to the surface integral of the curl, if the vector field over a surface is bounded by the curve. (5)

(b) Show that the electric field $\vec{E} = 6xy\hat{\imath} + (3x^2-3y^2)\,\hat{\jmath}$ is conservative. (3)

4. Show that the potential at a point due to electric dipole, having dipole moment $\vec{p}$ and located at a origin, at any point is

$$V = \frac{\vec{p}.\vec{r}}{4\pi\varepsilon_0 r^3}$$

Where $\vec{r}$ is the position vector of the observation point. Using this value of V find the electric field $\vec{E}$ at the same point. (8)

Section C

5. (a) Show that the potential function x^2-y^2+z satisfies the Laplace's equation (3)

(b) Derive the equation of continuity

$$\vec{\nabla}.\vec{J} + \frac{\partial \rho}{\partial x} = 0$$

What form will it take for steady currents? (5)

6. A charge is situated at a distance d from an infinite conducting sheet maintained at zero potential in the x-y plane. The source charge lies in the region $z>0$. Using method of images, find electric field at any point in the region $z>0$. Also find the induced surface charge density on the sheet. (8)

Section D

7. Derive and discuss the relation of the interaction of a moving charge on the other moving charge and also obtain the expression for the force between the parallel currents. (8)

8. Derive an expression for magnetic moment induced in an electron of an atom when diamagnetic material is placed in a uniform magnetic field. (6)

(b) Show that $\mu_r = 1 + \chi_m$, where μ_r is the relative permeability and χ_m is magnetic susceptibility. (2)

For Reappear Candidates (Old Syllabus (2020-21), (2021-22), (2022-23))

Exam Code: 121301 **Paper Code: 9146, 9147**

Bachelor of Science (Semester-I)

Course Title: Physics (Electricity and Magnetism)

Course Code: BSNM-1395 (II), BCSM-1395 (II)

Time Allowed: 3 Hours **Max Marks: 30**

Note: Attempt five questions in all, selecting at least one question from each section. The fifth question can be attempted from any Section. Each question carries **6 marks.** Students can use Non-Scientific calculators or logarithmic tables.

Section A

1. (a) A rigid body is rotating with a uniform angular velocity $\vec{\omega}$ about an axis passing through it. Show that curl $\vec{v} = 2\vec{\omega}$ where $\vec{v}$ is linear velocity. (3)

   (b) Given a vector $\vec{r} = x\hat{\imath} + y\hat{\jmath} + z\hat{k}$, show that $\nabla(\frac{1}{r^3}) = \frac{-3\vec{r}}{r^5}$ (3)

2. Calculate the electric field due to uniformly charged disc having surface charge density σ at a point on the axis of disc. What form does the expression for the electric field assume if the sheet is infinite? (6)

Section B

3. A thin metallic wire of length 2l carries a charge λ per unit length uniformly distributed along the wire. The wire lies along x-axis with its centre at the origin. Find the potential at a point distant r from the origin in the xy plane. (6)

4. Show that the potential due to arbitrary charge distribution at far off points from the charge distribution can be written as the sum of potentials due to monopole, dipole, quadruple etc. (6)

Section C

5. A charge is situated at a distance d from an infinite conducting sheet maintained at zero potential in the x-y plane. The source charge lies in the region z>0. Using method of images, find electric field at any point in the z>0. (6)

6. (a) Distinguish between current and current density. Show that the equation $\vec{\nabla}.\vec{J} + \frac{\partial \rho}{\partial x} = 0$ implies conservation of charge in space. (4)

   (b) Show that the potential function x^2-y^2+z satisfies the Laplace's equation. (2)

Section D

7. Show that the components of electric field $\vec{E}$ in the stationary frame are related to components of electric field $\vec{E}$ in the frame moving with the uniform velocity v along x axis by equations

   $E'_x = E_x$

   $E'_y = \gamma E_y$

   $E'_z = \gamma E_z$

   Where $\gamma = 1/\sqrt{1 - \frac{v^2}{c^2}}$ (6)

8. Derive an expression for the magnetic moment induced in an electron of an atom when diamagnetic material is placed in a uniform magnetic field. (6)

For Reappear Candidates Old Syllabus (2023-24)

Exam Code: 121301 **Paper Code: 9145**

Programme: Bachelor of Science (Semester-I)
Course Title: Physics (Mechanics)
Course Code: BSNM-1395 (I) and BCSM-1395 (I)

Time Allowed: 3 Hours **Max Marks: 60**

Note: Attempt five questions in all, selecting at least one question from each section. The fifth question can be attempted from any section. Each question carries 6 marks. Students can use Non-Scientific calculators or logarithmic tables.

Section-A

1. (a) What are cartesian coordinates? Find expressions for displacement, velocity and acceleration in cartesian coordinates . (8)

   (b) The cartesian coordinates of a particle vary with time as $x = 4sin2t, y = 4cos2t, z = 6t$, find velocity of particle? (4)

2. Define spherical polar coordinates and find their unit vectors? (12)

Section-B

3. State and prove Kepler's second law of planetory motion. (12)
4. Find total energy of a body moving under a central force. Prove that total energy and angular momentum of a body moving under a central force are always conserved. (12)

Section-C

5. What is Focault pendulum? Prove that the plane of oscillation of the bob of focault"s pendulum traces an elliptical path due to rotation of earth. Also find the time period of rotation at poles and equator. (12)
6. (a) Find expressions for horizontal and vertical accelerations on a particle moving on surface of earth at latitude λ in northern hemisphere due to rotation of earth. (8)

   (b) Explain the formation of cyclones and trade winds ? (4)

Section-D

7. What do you mean by differential and total cross-section of elastic scattering ? Find the realtionship between impact parameter and differential cross-section. (12)
8. Find the expression for torque acting of a rigid body about principal axes in terms of principal moments of inertia. (12)

For Reappear Candidates Old Syllabus (2020-21), (2021-22), (2022-23)

Exam Code: 121301 **Paper Code: 9144**

Programme: Bachelor of Science (Semester-I)
Course Title: Physics (Mechanics)
Course Code: BSNM-1395 (I) and BCSM-1395 (I)

Time Allowed: 3 Hours **Max Marks: 30**

Note: Attempt five questions in all, selecting at least one question from each section. The fifth question can be attempted from any section. Each question carries 6 marks. Students can use Non-Scientific calculators or logarithmic tables.

Section A

1. (a) What are cartesian coordinates? Find expressions for displacement, velocity and acceleration in cartesian coordinates . (4)

   (b) The cartesian coordinates of a particle vary with time as $x = 4sin2t$, $y = 4cos2t$, $z = 6t$, find velocity of particle? (2)

2. Define spherical polar coordinates and find their unit vectors? (6)

Section B

3. State and prove Kepler's second law of planetory motion. (6)
4. Find total energy of a body moving under a central force. Prove that total energy and angular momentum of a body moving under a central force are always conserved. (6)

Section C

5. What is Focault pendulum? Prove that the plane of oscillation of the bob of focault"s pendulum traces an elliptical path due to rotation of earth. Also find the time period of rotation at poles and equator. (6)
6. (a) Find expressions for horizontal and vertical accelerations on a particle moving on surface of earth at latitude λ in northern hemisphere due to rotation of earth. (4)

   (b) Explain the formation of cyclones and trade winds ? (2)

Section D

7. What do you mean by differential and total cross-section of elastic scattering ? Find the realtionship between impact parameter and differential cross-section. (6)
8. Find the expression for torque acting of a rigid body about principal axes in terms of principal moments of inertia. (6)

For Reappear Candidates only (2023- 24)

Exam Code: 121301 **Paper Code: 9151**

Bachelor of Science (Semester-I)
Course Title: Mathematics (Calculus and Trigonometry)
Course Code: BSNM/ BCSM-1333 (II)

Time Allowed: 3 Hours **Max. Marks: 60**

Note: Attempt five questions in all selecting at least one question from each section. The fifth question can be attempted from any section. Each question carries equal marks.

Section-A

1 (a) Prove that $\sqrt{7}$ is not a rational number (6)

(b) Solve for x: $\frac{2}{x-2} < \frac{x+2}{x-2} < 2$ (6)

2 (a) Show that $\lim_{x\to 0} sin\frac{1}{x}$ does not exist (6)

(b) Let $f(x) = \begin{cases} 1, x \le 3 \\ ax + b, 3 < x < 5 \\ 7, 5 \le x \end{cases}$ Determine the constants a and b so that f may be continuous for all x (6)

Section-B

3 (a) If $f(x) = tanx$, show that $f^v(0) = 16$ (6)

(b) Evaluate $\lim_{x\to 0}(sin\ x)^{tanx}$ (6)

4 (a) State and Prove Taylor's Theorem (6)

(b) If $y = (\sin^{-1} x)^2$, find $y_n(0)$ (6)

Section-C

5 (a) If $a = cis\alpha, b = cis\beta, c = cis\gamma$ and $a + b + c = 0$, then prove that $\frac{1}{a} + \frac{1}{b} + \frac{1}{c} = 0$ (6)

(b) Prove that $\left(\frac{\cos\theta + i\sin\theta}{\sin\theta + i\cos\theta}\right)^4 = \cos 8\theta + i\sin 8\theta$ (6)

6 (a) Find the primitive 8^{th} roots of unity (6)

(b) Expand $\cos 7\theta$ and $\sin 7\theta$ in powers of $\cos\theta$ and $\sin\theta$ (6)

Section-D

7 (a) If $i^{\alpha+i\beta} = \alpha + i\beta$, prove that $\alpha^2 + \beta^2 = e^{-(4n+1)\beta\pi}$ (6)

(b) If $-\frac{\pi}{4} \le \theta \le \frac{\pi}{4}$, then prove that $\theta = \tan\theta - \frac{1}{3}\tan^3\theta + \frac{1}{5}\tan^5\theta - \ldots\ldots$ (6)

8 (a) Sum the series upto n terms $\tan^{-1}\frac{1}{3} + \tan^{-1}\frac{2}{9} + \tan^{-1}\frac{4}{33} + \ldots\ldots$ and deduce the sum upto infinity (6)

(b) Sum the series upto infinity $1 - \frac{\cos 2\theta}{2!} + \frac{\cos 4\theta}{4!} - \frac{\cos 6\theta}{6!} + \ldots\ldots$ (6)

(For Reappear Candidates Only (2023-24))

Exam Code: 121301 **Paper Code - 9149**

Bachelor of Science (Semester-I)

Course Title: Mathematics (Algebra)

Course Code: BSNM/ BCSM -1333 (I)

Time Allowed: 3 Hours **Max Marks: 80**

Note: Attempt five questions in all, selecting at least one question from each section. The fifth question can be attempted from any section. Each question carries equal (16) marks.

Section-A

1 (a). Find the inverse of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 6 \end{bmatrix}$ by elementary row operations. (8)

(b). Solve the equations:

$$2x - y + 3z = 0\,; 3x + 2y + z = 0\,; x - 4y + 5z = 0$$ (8)

2 (a). Check the linear dependence or linear independence of the following vectors

$$u = (2,3,1), v = (-1,4,2)\,, w = (1,18,-4)$$ (8)

(b). Find the matrices P and Q such that PAQ is in the normal form, when A is the matrix

$$A = \begin{bmatrix} 1 & -1 & 2 & -1 \\ 4 & 2 & -1 & 2 \\ 2 & 2 & -2 & 0 \end{bmatrix}$$ (8)

Section-B

3 (a). Prove that the characteristic root of a Hermitian matrix are real. (6)

(b). Verify Cayley-Hamilton theorem for the matrix $A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & -1 & 1 \\ 0 & 1 & 0 \end{bmatrix}$ (10)

4 (a). Find the Eigen values and corresponding Eigen vectors of the matrix $\begin{bmatrix} 1 & 1 & 1 \\ 0 & 2 & 1 \\ 0 & 2 & 3 \end{bmatrix}$ (10)

(b). Write down the quadratic form corresponding to the symmetric matrix $\begin{bmatrix} 2 & 4 & 5 \\ 4 & 3 & 1 \\ 5 & 1 & 1 \end{bmatrix}$ (6)

Section-C

5 (a).Classify the following form as definite, semi-definite and indefinite:

$$6x^2 + 3y^2 + 14z^2 + 4yz + 18zx + 4xy$$ (8)

(b).Reduce the following quadratic forms to sum of squares by linear transformation:

$$2x^2 + 9y^2 + 6z^2 + 8xy + 8yz + 6zx$$ (8)

6 (a). Reduce the following to conanical forms and find the rank and index:

$$x^2 + 2y^2 + 3z^2 + 2xy + 2yz - 2zx$$ (8)

(b). Prove that every real positive definite or semi-definite matrix can be represented as gram matrix. (8)

Section-D

7 (a). Find the condition that roots of the equation $x^3 + 3ax^2 + 3bx + c = 0$ may be in A.P. Hence show that the roots of $2x^3 + 6x^2 + 5x + 1 = 0$ are in A.P. (8)

(b).Transform the equation $x^4 + 4x^3 + x^2 - 6x = 0$ into one of the same degree in which second term is missing. Also solve the equation. (8)

8 (a). Find the sum of cubes of the roots of the equation $x^3 - 2x^2 + x - 1 = 0$ (6)

(b). Use Cardan's method to solve $x^3 - 3x^2 - 9x - 54 = 0$ (10)

Paper Code: 1116

Programme	Exam code	Course Code
Bachelor of Science (Non-Medical) Semester I	121301	BSNL-1333
Bachelor of Science (Computer Science) Semester I		BCSL-1333
Bachelor of Science (Economics) Semester I		BECL-1333
Bachelor of Arts Semester I	121201	BARL-1333

Course Title: Mathematics (Algebra)

Time: 3 Hours **Max. Marks: 70**

Note: Attempt five questions, selecting one question from each section. The fifth question can be attempted from any section. Each question carries 14 marks.

Section-A

1 (a) Find non-singular matrices P and Q such that PAQ is in normal form where $A=\begin{bmatrix} 1 & 2 & -1 & 3 \\ -2 & -4 & 4 & -7 \\ 1 & 2 & 1 & 2 \end{bmatrix}$. Hence determine rank of A.

(b) Reduce the matrix A to row echelon form where

$A=\begin{bmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{bmatrix}$. Also determine row rank of A.

2 (a) Prove that the system of vectors u=(1,2,3), v=(4,1,5) , w=(-4,6,2) is linearly dependent.

(b) Investigate for what values of λ *and* μ, the simultaneous equations

$$x+y+z=6, x+2y+3z=10, x+2y+\lambda z=\mu$$

have i) no solution ii) unique solution iii) infinite many solutions

Section-B

3 (a) Determine the eigen values and eigen vectors of the matrix

$A=\begin{bmatrix} 3 & 1 & 1 \\ 2 & 4 & 2 \\ 1 & 1 & 3 \end{bmatrix}$. Is it diagonalizable? Justify.

(b) Obtain the quadratic form corresponding to the matrix $\begin{bmatrix} 0 & 1 & 2 & 3 \\ 1 & 2 & 3 & 4 \\ 2 & 3 & 4 & 5 \\ 3 & 4 & 5 & 6 \end{bmatrix}$.

(c) Prove that if the eigen values of A are $\lambda_1, \lambda_2 \ldots \ldots, \lambda_n$ then the eigen values of A^2 are $\lambda_1{}^2, \lambda_2{}^2 \ldots\ldots \lambda_n{}^2$.

4 (a) Find minimal polynomial for the matrix $A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$. Find A^{-1} using minimal polynomial.

(b) Define Quadratic form. Write down the quadratic form corresponding to the matrix $\begin{bmatrix} 1 & 3 & 4 \\ 3 & 1 & 7/2 \\ 4 & 7/2 & 1 \end{bmatrix}$.

Section-C

5 (a) Define Gram Matrix. Prove that every positive definite or semi-definite matrix can be represented as a gram matrix.

(b) Show that the quadratic form $6x^2 + 17y^2 + 3z^2 - 20xy - 14yz + 8zx$ is semi-definite. Find non-zero set of values of the variables x, y, z which makes the form zero.

6 (a) Reduce the given quadratic form to the sum of squares by linear transformation

$$2x^2 + 9y^2 + 6z^2 + 8xy + 8yz + 6zx$$

(b) What do you understand by Congruence of Matrices and Quadratic forms. Prove that a non-singular symmetric matrix A is congruent to its inverse.

Section-D

7 (a) Remove the second term from the equation $4x^4 + 32x^3 + 83x^2 + 76x + 21 = 0$ and hence solve it completely

(b) If α,β,γ are the roots of $3x^3 + 6x^2 - 9x + 2 = 0$, find the value of $\sum \alpha/\beta$

8 (a) If α, β, γ are roots of $4x^3 - 12x^2 + 5x + 6 = 0$, then find the equation whose roots are

$$\alpha + \frac{1}{2}, \beta + \frac{1}{2}, \gamma + \frac{1}{2}.$$

(b) Using Cardon Method, show that roots of the equation $x^3 - 3x + 1 = 0$ are

$$2\cos\frac{2\pi}{9}, 2\cos\frac{8\pi}{9}, 2\cos\frac{14\pi}{9}$$

Lib 16/12/24 (E) KMV-II

Paper Code: 1102

Programme	Exam Code	Course Code
Bachelor of Arts	121201	BARL-1421
Bachelor of Science (Medical)	121301	BSML-1421
Bachelor of Science (Non-Medical)		BSNL-1421
Bachelor of Science (Computer Science)		BCSL-1421
Bachelor of Science (Economics)		BECL-1421
Bachelor of Commerce	121101	BCRL-1421
Bachelor of Business Administration	121701	BBRL-1421
Bachelor of Business Administration (Airlines and Airport Management)	509501	BBML-1421

Semester-I

Course Title: Punjabi (Compulsory)
(300)

Time Allowed: 3 Hours **Max Marks: 70**

ਨੋਟ:- ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਚਾਰ ਸੈਕਸ਼ਨ ਹਨ। ਹਰੇਕ ਵਿੱਚੋਂ ਇੱਕ ਪ੍ਰਸ਼ਨ ਕਰਨਾ ਲਾਜ਼ਮੀ ਹੈ। ਪੰਜਵਾਂ ਪ੍ਰਸ਼ਨ ਕਿਸੇ ਵੀ ਸੈਕਸ਼ਨ ਵਿੱਚੋਂ ਕੀਤਾ ਜਾ ਸਕਦਾ ਹੈ। ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਅੰਕ 14 ਹਨ।

ਸੈਕਸ਼ਨ – 1

1. ਰਾਧਾ ਸੰਦੇਸ਼ ਕਵਿਤਾ ਦਾ ਵਿਸ਼ਾ ਵਸਤੂ ਲਿਖੋ ।
2. ਮਜ਼ਦੂਰ ਕਵਿਤਾ ਦਾ ਸਾਰ ਲਿਖੋ ।

ਸੈਕਸ਼ਨ – 2

3. ਮੀਰਾ ਬਾਈ ਜੀਵਨੀ ਦੇ ਆਧਾਰ 'ਤੇ ਉਸਦਾ ਨਾਇਕ ਬਿੰਬ ਉਸਾਰੋ।
4. ਗੁਰੂ ਰਾਮਦਾਸ ਜੀ ਦੀ ਜੀਵਨੀ ਦਾ ਸਾਰ ਲਿਖੋ ।

ਸੈਕਸ਼ਨ – 3

5. ਹੇਠ ਲਿਖੇ ਕਿਸੇ ਇਕ ਵਿਸ਼ੇ ਤੇ ਪੈਰ੍ਹਾ ਰਚਨਾ ਕਰੋ।
   1. ਲਾਇਬਰੇਰੀ
   2. ਫੈਸ਼ਨ
   3.ਕਿਰਤ
6. ਹੇਠ ਲਿਖੇ ਪੈਰ੍ਹੇ ਨੂੰ ਪੜ੍ਹ ਕੇ ਦਿੱਤੇ ਪ੍ਰਸ਼ਨਾਂ ਦੇ ਉੱਤਰ ਦਿਓ-

   ਜਹਾਂਗੀਰ ਆਪਣੇ ਬਹੁਤ ਸਾਰੇ ਕੰਮਾਂ ਵਿਚ ਆਪਣੇ ਬਾਪ ਅਕਬਰ ਬਾਦਸ਼ਾਹ ਦੇ ਬਿਲਕੁਲ ਉਲਟ ਸੀ, ਪਰ ਧਾਰਮਿਕ ਵਿਚਾਰਾਂ ਵਿਚ ਤਾਂ

ਦੋਹਾਂ ਵਿਚ ਜਮੀਨ ਅਸਮਾਨ ਦਾ ਫ਼ਰਕ ਸੀ। ਅਕਬਰ ਨੇ ਜਿੱਥੇ ਸਾਰੇ ਧਰਮਾਂ ਨੂੰ ਚੰਗਾ ਜਾਣਦੇ ਹੋਏ ਆਪਣੀ ਹਕੂਮਤ ਨੂੰ ਪੱਕਿਆਂ ਕਰਨ ਲਈ ਆਪਣੇ ਵਿਚਾਰ ਅਨੁਸਾਰ ਇਕ ਨਵੇਂ ਧਰਮ ਦੀ ਬੁਨਿਆਦ ਰੱਖ ਕੇ ਇਸਲਾਮੀ ਤੁਅੱਸਬ ਨੂੰ ਦੂਰ ਹਟਾ ਕੇ ਲੋਕਾਂ ਨੂੰ ਖੁਸ਼ ਕਰਨ ਦੀ ਪਾਲਿਸੀ ਅਖਤਿਆਰ ਕੀਤੀ ਸੀ, ਉੱਥੋਂ ਜਹਾਂਗੀਰ ਬਿਲਕੁਲ ਉਸ ਦੇ ਵਿਰੁੱਧ ਇਸਲਾਮੀ ਤੁਅੱਸਬ ਦਾ ਪੁਤਲਾ ਸੀ ਤੇ ਆਪਣੇ ਬਾਪ ਦੇ ਧਾਰਮਿਕ ਵਿਚਾਰਾਂ ਦੇ ਕਾਰਨ ਉਸ ਦੇ ਅੰਦਰੋ-ਅੰਦਰੀ ਸਖ਼ਤ ਵਿਰੋਧੀ ਸੀ। ਇਸ ਦਾ ਸਬੂਤ ਇਸ ਗੱਲ ਤੋਂ ਮਿਲਦਾ ਹੈ ਕਿ ਜਹਾਂਗੀਰ ਨੇ ਆਪਣੇ ਬਾਪ ਦੇ ਨਵੇਂ ਧਰਮ ਚਲਾਉਣ ਦੇ ਇਰਾਦੇ ਵਿਚ ਮਦਦ ਕਰਨ ਵਾਲੇ ਉਸ ਦੇ ਇਕ ਪੱਕੇ ਦੋਸਤ ਅੱਬੁਲ ਫਜ਼ਲ ਨੂੰ ਮਰਵਾ ਦਿੱਤਾ ਸੀ।

1. ਧਰਮ ਸੰਬੰਧੀ ਅਕਬਰ ਦੇ ਕੀ ਵਿਚਾਰ ਸਨ?
2. ਜਹਾਂਗੀਰ ਨੇ ਅੱਬੁਲ ਫਜ਼ਲ ਨੂੰ ਕਿਉਂ ਮਰਵਾਇਆ ਸੀ?
3. ਅਕਬਰ ਦਾ ਜਹਾਂਗੀਰ ਨਾਲ ਕੀ ਰਿਸ਼ਤਾ ਸੀ?
4. ਪੈਰ੍ਹੇ ਦਾ ਢੁੱਕਵਾਂ ਸਿਰਲੇਖ ਦਿਉ।

ਸੈਕਸ਼ਨ – 4

7. ਉਪ ਭਾਸ਼ਾ ਦੀ ਪਰਿਭਾਸ਼ਾ ਦਿੰਦਿਆਂ ਪੰਜਾਬੀ ਉਪ ਭਾਸ਼ਾਵਾਂ ਦੇ ਪਹਿਚਾਣ ਚਿੰਨ੍ਹ ਦੱਸੋ ।
8. ਟਕਸਾਲੀ ਭਾਸ਼ਾ ਦੀ ਪਰਿਭਾਸ਼ਾ ਦਿੰਦਿਆਂ ਇਸ ਦੀਆਂ ਵਿਸ਼ੇਸ਼ਤਾਵਾਂ ਦੱਸੋ।

Paper Code: 1112

Programme	Exam Code	Course Code
Bachelor of Arts	121201	BARL-1212
Bachelor of Science (Medical)	121301	BSML-1212
Bachelor of Science (Non-Medical)		BSNL-1212
Bachelor of Science (Computer Science)		BCSL-1212
Bachelor of Science (Economics)		BECL-1212

Semester-I

Course Title: English Language Skills - I

(230)

Time Allowed: 3 Hours **Max Marks: 70**

Note: Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section. Each question carries equal marks.

SECTION A

Q1. (i) Put the verb into the correct form, positive or negative

a. The washing machine has been repaired ___ (It/work) now.

b. Ben is a student, but he's not very happy. _____ (He/enjoy) his course.

(ii) You ask Lisa questions about herself & her family. Write the questions.

a. You know that Lisa plays Tennis. You want to know how often. Ask her

- How often _____

b. You know that Lisa goes to the cinema a lot.

You want to know how often. Ask her

How often _____

(iii) Put the verb in the correct form, present continuous or present simple.

1. a. _____ (you/listen)to the radio ? 'No ,you can turn it off'.

   b._____ (you/listen) to the radio a lot? 'No, not very often'.

2. (a). _____ (I/get) hungry. Let's go and eat something
   (b) _____ (i/usually/get) hungry in the afternoon

(iv) Are the underlined verbs ok? Correct them where necessary.

a. Nicky is thinking of giving up her job
b. It's not true. I'm not believing it.

(v) Complete the sentences and put the verbs into the correct form, positive or negative.

a. We were very tired, so we_____ the party early. (leave)
b. The watch wasn't expensive. It ____ much. (cost)

(vi) Put the verb into the correct form, past continuous or past simple.

a. I ___ (see) Sue in town yesterday, but she _____ (not/see) me.
b. I ___ (cycle) home yesterday when a man _____ (step) out into the road in front of me.

(vii) Put in been or gone

a. My parents are on holiday. They've ____ to Italy
b. Hello! I've just ____ to the shops. I have bought lots of things

Q2. (i) You ask people about things they have done. Write questions with ever.

a. (ride/horse)
b. (be/California)

(ii) Read the situations and complete the sentences

a. Its raining. The rain started two hours ago

   It's _____ for two hours.

b. I am learning Japanese. I started classes in December

   I _____ since December.

(iii) Read the situation and complete the sentences. Use verb in brackets

a. Tom started reading a book two hours ago. He is still reading it and now he is on page 53.

   _____ for two hours. (read)

   _____ 53 pages so far. (read)

b. When they left college, Lisa and Sue started making films together. They still make films.

   They _____ films since they left college. (make)

   _____ five films since they left college. (make)

(iv) Which is correct:

a) I like your house. How long do you live/have you lived here?
b) Lisa is in Germany. She's/She's been there on a business trip.

(v) Put the verb into the correct form , present or past , active or passive:

a) The boat hit a rock and _____(sink) quickly.
b) Fortunately everybody _____ (rescue).

(vi) Complete the sentences. Use the present perfect where possible. Otherwise use the past simple

a) I can't get in. I ____ (lose) my key
b) The office is empty now. Everybody _____ (go) home

(vii) Write sentences about yourself using ideas in brackets

a) (something you didn't do yesterday)
b) (something you've done recently)

SECTION-B

Q3. write a Paragraph on:

The influence of peer pressure in college life.

Q4. (i) Complete the sentences.

a. I would be very scared if _____ (somebody/point) gun at me.
b. If you had a party, who ____ (you/invite)?

(ii) Write sentences with IF for each situation

a. We don't see you very often because you live so far away
- We _____ if _____
b. We would like to go on a holiday but we can't afford it
- We _____ if _____

(iii) For each situation, write a sentence with I wish

a. You have eaten too much and now you feel sick

   You say :

   I wish _____

b. When you were young, you never learnt to play a musical instrument. Now you regret this

   You say :

   I wish _____

(iv) **Complete the sentences**

a. Jack is going on a trip to Mexico soon. I wish I _____ too.

b. I am very tired and I have so much to do. I wish I _____ so tired.

(v) **Put the verb in correct form present or past, active or passive**

a. Two hundred people _____ (employ) by the company.

The company ____ (employ) two hundred people.

b. Water _____ (cover) most of the earth surface.

How much of the earth's surface _____ (cover) by water.

(vi) **Make sentences from the words in brackets. Sometimes the verb is active or passive.**

a. I went into the room and saw that the table and the chairs were not in the same place.

(The furniture/move). The _____

b. The bridge was damaged recently.

(it/repair at the moment) It _____

(vii) **Complete the sentences.**

a. I have been _____ the job, but I don't think that I will accept it.
b. Which year _____ you born in?

SECTION-C

Q5. (a) Write in detail the character descriptions of misers and spendthrifts as depicted in the chapter On Spendthrifts?

(b) What does 'democracy ' generally mean? How does it vary from country to country? (A Dialogue on Democracy)

Q6. a) What is the main argument given by Richard Gordon in The Power Of Women?

(b) The Universal Declaration of Human Rights is a charter for the full growth of the potential of the human being. Discuss in detail.

SECTION-D

Q7. (a) What themes does R.K Narayan explore in the Beauty and The Beast?

(b) Write in detail the story of Pabuji's heroism and its impact on the audience.

Q8. (a) What role does humour play in Symptoms?

(b) Give a character sketch of Miss Beam in The School for Sympathy.

Paper Code: 1105

Programme	Exam Code	Course Code
Bachelor of Arts	121201	BARL-1031
Bachelor of Science (Medical)	121301	BSML-1031
Bachelor of Science (Non-Medical)		BSNL-1031
Bachelor of Science (Computer Science)		BCSL-1031
Bachelor of Science (Economics)		BECL-1031
Bachelor of Science (Medical Laboratory Technology)	509701	BMLL-1031
Bachelor of Commerce	121101	BCRL-1031
Bachelor of Business Administration	121701	BBRL-1031
Bachelor of Business Administration (Airlines and Airport Management)	509501	BBML-1031
Bachelor of Arts (Journalism and Mass Communications)	116401	BJML-1031
Bachelor of Science (Fashion Designing)	119601	BFDL-1031
Bachelor of Science (Home Science)	119701	BHSL-1031
Bachelor of Computer Applications	117901	BCAL-1031
Bachelor of Science (Information Technology)	118001	BITL-1031
Bachelor of Science (Bio-Technology)	120601	BBTL-1031

Semester-I

Course Title: Basic Punjabi

(50)

Time Allowed: 3 Hours **Max Marks: 70**

ਨੋਟ:- ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਚਾਰ ਸੈਕਸ਼ਨ ਹਨ।ਹਰੇਕ ਭਾਗ ਵਿੱਚੋਂ ਇੱਕ ਪ੍ਰਸ਼ਨ ਕਰਨਾ ਲਾਜ਼ਮੀ ਹੈ। ਪੰਜਵਾਂ ਪ੍ਰਸ਼ਨ ਕਿਸੇ ਵੀ ਸੈਕਸ਼ਨ ਵਿੱਚੋਂ ਕੀਤਾ ਜਾ ਸਕਦਾ ਹੈ। ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਅੰਕ 14 ਹਨ।

ਸੈਕਸ਼ਨ 1

1. ਲਗਾਂ ਮਾਤਰਾਵਾਂ ਤੋਂ ਕੀ ਭਾਵ ਹੈ ਸੰਖੇਪ ਜਾਣਕਾਰੀ ਦਿਓ।
2. ਲਗਾਖ਼ਰ ਦੀ ਪਰਿਭਾਸ਼ਾ ਦਿੰਦੇ ਹੋਏ ਉਦਾਹਰਨਾਂ ਸਹਿਤ ਜਾਣਕਾਰੀ ਦਿਓ ।

ਸੈਕਸ਼ਨ 2

3. ਸੰਯੁਕਤ ਸ਼ਬਦ ਤੋਂ ਕੀ ਭਾਵ ਹੈ ਉਦਾਹਰਣ ਸਹਿਤ ਬਿਆਨ ਕਰੋ।
4. ਪਿਛੇਤਰ ਦੀ ਪਰਿਭਾਸ਼ਾ ਦਿੰਦੇ ਹੋਏ ਕੋਈ ਪੰਜ ਪਿਛੇਤਰ ਬਣਾਓ।

ਸੈਕਸ਼ਨ 3

5. ਵਪਾਰ ਨਾਲ ਸੰਬੰਧਿਤ ਕੋਈ 10 ਸ਼ਬਦ ਲਿਖੋ।
6. ਕੋਈ ਦਸ ਰਿਸ਼ਤਿਆਂ ਦੇ ਨਾਮ ਲਿਖੋ।

ਸੈਕਸ਼ਨ 4

7. ਹਫ਼ਤੇ ਦੇ ਸੱਤ ਦਿਨਾਂ ਦੇ ਨਾਮ ਲਿਖੋ।
8. ਰੁੱਤਾਂ ਦੇ ਨਾਮ ਲਿਖੋ ।

Paper Code: 1108

Programme	Exam Code	Course Code
Bachelor of Arts	121201	BARL-1431
Bachelor of Science (Non-Medical)	121301	BSNL-1431
Bachelor of Science (Medical)		BSML-1431
Bachelor of Science (Economics)		BECL-1431
Bachelor of Science (Computer Science)		BCSL-1431
Bachelor of Science (Medical Laboratory Technology)	509701	BMLL-1431
Bachelor of Commerce	121101	BCRL-1431
Bachelor of Business Administration	121701	BBRL-1431
Bachelor of Business Administration (Airlines and Airport Management)	509501	BBML-1431
Bachelor of Arts (Journalism and Mass Communication)	116401	BJML-1431
Bachelor of Science (Fashion Designing)	119601	BFDL-1431
Bachelor of Science (Home Science)	119701	BHSL-1431
Bachelor of Computer Applications	117901	BCAL-1431
Bachelor of Science (Information Technology)	118001	BITL-1431
Bachelor of Science (Bio-Technology)	120601	BBTL-1431

Semester-I

Course Title: Punjab History and Culture

(50)

Time Allowed: 3 Hours **Max Marks: 70**

Candidates shall attempt 5 questions in 800 words each by selecting atleast one question from each section and the 5th question may be attempted from any of the four Sections. Each question carries 14 marks.

Section-A

1. Discuss the physical features of the Punjab. What were social, economic and religious effects of those features?
2. Describe the literacy and Archaeological sources of the ancient history of Punjab.

Section-B

3. Study the Social and economic life of people of Indus Valley People.
4. Discuss the various theories regarding original home of Aryans in Punjab.

Section-C

5. Briefly describe the religious life of people of Rig Vedic Age?
6. Briefly describe the economic life of people of Later Vedic Age?

Section-D

7. What is the contribution of Mahatma Buddha.
8. Discuss the contribution of Mahavir Swami.

Hindi Version

भाग–1

1. पंजाब की भौतिक विशेषताओं पर चर्चा करें। उन विशेषताओं के सामाजिक, आर्थिक और धार्मिक प्रभाव क्या थे?

2. पंजाब के प्राचीन इतिहास की साक्षरता एवं पुरातात्विक स्त्रोतों का वर्णन करें।

भाग–2

3. सिंधु घाटी के लोगों के सामाजिक और आर्थिक जीवन का अध्ययन करें।

4. पंजाब में आर्यों के मूल निवास स्थान के संबंध में विभिन्न सिद्धांतों पर चर्चा करें।

भाग–3

5. ऋग्वैदिक युग के लोगों के धार्मिक जीवन का संक्षेप में वर्णन करें?

6. उत्तर वैदिक युग के लोगों के आर्थिक जीवन का संक्षेप में वर्णन करें?

भाग–4

7. महात्मा बुद्ध का योगदान क्या है?

8. महावीर स्वामी के योगदान की चर्चा करें।