

Roll No.

Total No. of Pages : 02

Total No. of Questions : 09

Bachelor of Science (Non-Medical) (Sem.-4)

ELECTRONICS

Subject Code : BSNM404-18

M.Code : 77682

Date of Examination : 11-12-2025

Time : 3 Hrs.

Max. Marks : 50

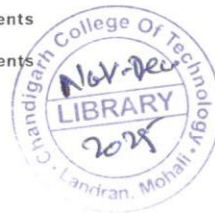
INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying ONE marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION - A

1. Write briefly :

- a) What do you understand by an ideal diode? Draw its V-I characteristics.
- b) Compare the performance of half-wave and full-wave rectifiers.
- c) Compare photodiode with light-emitting diodes.
- d) What is feedback? Define negative and positive feedback in an amplifier.
- e) What is the Barkhausen criterion for sustained oscillations?
- f) Enlist the advantages and disadvantages of negative feedback.
- g) Define Amplitude modulation. What are its limitations?
- h) Determine the value of base x if $(50)_x = (203)_4$.
- i) Convert $(250.5)_{10} = (?)_8$.
- j) Compare FET with MOSFET.



SECTION - B

2. Write a short note on :

- a) Photocells
- b) Oscilloscope.
3. Describe the circuit diagram of a Zener diode as a voltage regulator.
4. Explain the working of the emitter follower circuit. Why is it called so?
5. Explain the working of a crystal oscillator.
6. Simplify the following using K-map :
 $F(w, x, y, z) = \sum m(0, 1, 2, 4, 5, 12, 13, 14) + \text{don't care conditions } \sum d(6, 7, 8, 9).$

SECTION - C

7.
 - a) Explain the effect of temperature on semiconductor conductivity.
 - b) Describe the working of the Wein Bridge oscillator. Also, derive the expression for the frequency of oscillation.
8. Explain the following logic gate with its diagram, truth table and logic expression :
 - a) AND Gate
 - b) NOT Gate
 - c) NAND Gate
 - d) NOR Gate
 - e) XOR Gate
9.
 - a) Describe the input and output characteristics of a Common Base transistor.
 - b) Explain the working of the Enhancement-type MOSFET.

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Roll No.

Total No. of Questions : 09

B.Sc. (Non - Medical) (SEM - II)

ANALYSIS-I

Subject Code : BSHM-308-18

M.Code : 76904

Date of Examination: 29-11-2023

Time : 3 Hrs.

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is **COMPULSORY** consisting of TEN questions carrying ONE mark each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

I. Write briefly:

- a) State Cauchy's root test for convergence.
- b) Give an example of an alternating series.
- c) Define absolute convergence of a series.
- d) Write the formula for Cauchy's integral test.
- e) What is the value of $\Gamma\left(\frac{1}{2}\right)$?
- f) Define improper integral.
- g) State the fundamental theorem of integral calculus.
- h) Write the relation between Beta and Gamma functions.
- i) Define monotonic function.
- j) What is meant by conditional convergence?

SECTION - B

2. Test the convergence of the series $\sum_{n=1}^{\infty} \frac{n!}{n^n}$ using the root test.
3. Determine whether the series $\sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{n}$ is absolutely or conditionally convergent.
4. Evaluate the improper integral $\int_1^{\infty} \frac{1}{x^p} dx$ and discuss its convergence for different values of p .
5. State and prove the mean value theorem for Integrals.
6. Find $\int_0^1 x^2(1-x^3)dx$ using Beta function.

SECTION - C

7. Test the convergence of $\sum_{n=1}^{\infty} \frac{1}{n(\ln n)^2}$ by Cauchy's condensation test.
8. Define Riemann Integrable function. Also, prove that every continuous function on $[a, b]$ is Riemann integrable.
9. Prove the relation $B(m, n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$ and using this, evaluate $\int_0^1 \sqrt{x}(1-x)^{\frac{1}{2}} dx$.

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Roll No.

Total No. of Pages : 02

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B.Sc. (Non-Medical)(Sem.-3)
DIFFERENTIAL EQUATIONS

Subject Code :BSNM-306-18

M.Code :76905

Date of Examination: 02-12-2025

Time : 3 Hrs.

Max. Marks :50

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying ONE mark each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

1. Write briefly:

- a) Write necessary and sufficient condition for the differential equation $Mdx+Ndy=0$ to be exact.
- b) Solve $p = \log(px-y)$.
- c) Write Cauchy's Homogeneous equation.
- d) Form partial differential equation by eliminating arbitrary constants a and b from the following relation $z=ax+by+ab$.
- e) Solve $at(p+q) = z$.
- f) Solve $(4D^2 + 12DD' + 9D'^2)z = 0$.
- g) Find the particular integral of $(2D^2 - 5DD' + 2D'^2)z = 24(y-x)$.
- h) Solve $\frac{d^4y}{dx^4} - 7\frac{dy}{dx} - 6y = 0$.
- i) Define partial differential equation.
- j) Define general solution of a differential equation.

SECTION - B

2. Solve $(3xy^2 - y^3)dx - (2x^2y - xy^3)dy = 0$.
3. Solve $(D+2)(D-1)^2y = e^{-2x} + 2\sinh x$.
4. Solve by method of Variation of parameters the differential equation $\frac{d^2y}{dx^2} + y = \sec x$.
5. Find the surface which intersects the surfaces of the system $z(x+y)=c(3z+1)$ orthogonally and which passes through the circle $x^2 + y^2 = 1, z=1$.
6. Solve $2r - s - 3t = \frac{5e^x}{e^y}$.

SECTION - C

7. a) Find complete integral of $(x^2 - y^2)pq - xy(p^2 - q^2) = 1$.
b) Find the complete integral of $x(1+y)p = y(1+x)q$.
8. a) Form partial differential equation by eliminating function f from $z = e^{ax+by} f(ax-by)$.
b) Find the integral surface of the linear first order partial differential equation $yp + xq = z-1$ which passes through the curve $z = x^2 + y^2 + z, y = 2x$.
9. Solve $\frac{d^2y}{dx^2} + \cot x \frac{dy}{dx} + 4y \operatorname{Cosec}^2 x = 0$

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Roll No.

Total No. of Pages : 02

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B.Sc. (Non-Medical) (Sem.-4)

ANALYSIS-II

Subject Code : BSNM405-18

M.Code : 77683

Date of Examination : 13-12-2025

Time : 3 Hrs.

Max. Marks : 50

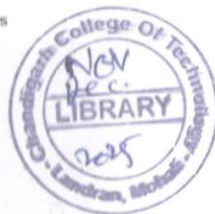
INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying ONE mark each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION - A

1. Write briefly :

- a) Define point wise convergence of a sequence of functions.
- b) State Cauchy's criterion for uniform convergence for a sequence of functions.
- c) What is Weierstrass's M-test?
- d) Give an example of a uniformly convergent series of functions.
- e) Write the formula for the gradient of a scalar field.
- f) Define curl of a vector field.
- g) State Stokes' theorem.
- h) Define even and odd functions in the context of Fourier series.
- i) Write the general expression for Fourier coefficients a_n & b_n .
- j) Define half-range cosine series.



SECTION - B

2. Test the convergence and uniform convergence of $f_n(x) = \frac{x}{n+x}$ on $[0, 1]$.
3. Prove that if $f_n(x) \rightarrow f(x)$ uniformly on $[a, b]$, then $f(x)$ is continuous on $[a, b]$ where $f_n(x)$ is a sequence of continuous function on $[a, b]$.
4. Using Weierstrass's M-test, show that the series $\sum_{n=1}^{\infty} \frac{x^n}{n^2}$ converges uniformly on $[0, 1]$.
5. If $F(x, y, z) = x^2 + y^2 + z^2$, find ∇F , $\text{div}(\nabla F)$ and $\text{curl}(\nabla F)$.
6. Evaluate $\iiint_V (x + y + z) dV$ over the cube bounded by $x, y, z = 0$ and $x, y, z = 1$.

SECTION - C

7. a) Prove that if $\sum f_n(x)$ converges uniformly to $f(x)$, then $\int_a^b f_n(x) dx \rightarrow \int_a^b f(x) dx$.
b) Test for uniform convergence of $\sum_{n=1}^{\infty} \frac{x^n}{1+x^n}$ on $[0, 1]$.
8. a) Verify Gauss divergence theorem for the vector field $\vec{F} = x\hat{i} + y\hat{j} + z\hat{k}$ over the surface of the sphere $x^2 + y^2 + z^2 = a^2$.
b) Find divergence and curl of $\vec{F} = yz\hat{i} + xz\hat{j} + xy\hat{k}$.
9. a) Obtain the Fourier series expansion of $f(x) = x^2$ in $(-\pi, \pi)$.
b) Find the half-range sine series for $f(x) = x$ in $[0, \pi]$.

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B.Sc(Non-Medical)(Sem.-5)
THEORY OF PROBABILITY
Subject Code :BSNM-505-18
M.Code :78619
Date of Examination :29-11-2025

Time : 3 Hrs.

Max. Marks :50

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying ONE marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

1. Write briefly :

- a) State Chebychev's inequality.
- b) Find the mean of the following function:

$$f(x) = Ce^{\frac{-1}{24}(x^2 - 6x - 9)} - \infty \leq x \leq \infty, c \text{ being a constant.}$$

- c) What do you mean by continuous distribution function?
- d) If t is the number of points rolled with a balanced die, find the expected value of $g(t) = 2t$.
- e) What is probability density function of gamma distribution?
- f) Let x be the number of years before a certain kind of pump needs replacement. Let x have the probability function $f(x) = kx^2, x = 0, 1, 2, 3, 4$. Find k .
- g) What is the relationship between probability density function and cumulative distribution function?
- h) If the probability of producing a defective screw is $p = 0.01$, what is the probability that a lot of 100 screws will contain more than 1 defective?
- i) Define addition law of probability.
- j) State Bayes theorem.

SECTION-B

2. A lot of 12 television sets includes 2 with white cords. If 3 of the sets are chosen at random for shipment to a hotel, how many sets with white cords can the shipper expect to send to the hotel?
3. In a distribution of 10 observations, the value of mean and standard deviation are given as 20 and 8. By mistake, two values are taken as 2 and 6 instead of 4 and 8. Find out the value of correct mean and variance.
4. If X is the number of points rolled with a balanced die, find the expected value of $g(X) = 2X^2 + 1$.
5. Show that $\int_0^\infty \frac{\lambda^\alpha}{\Gamma(\alpha)} x^{\alpha-1} e^{-\lambda x} dx = 1$. Find mean and variance of gamma distribution.
6. If the mean weight of certain empty containers is 5 pound and the standard deviation is 0.2 pound and if the filling of the containers has mean weight 100 pound and standard deviation 0.5 pound, what are the mean weight and the standard deviation of filled containers?

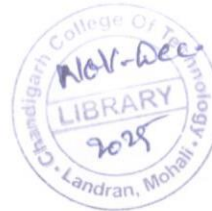
SECTION-C

7. If X is a Poisson variate such that $P(X = 2) = 9 P(X = 4) + 90 P(X = 6)$, find the variance.
8. The mean weight of 500 male students in a certain college is 151 lbs and standard deviation is 15 lbs. Assuming the weights are normally distributed find how many students weigh:
 - a) Between 120 and 155 lbs.
 - b) More than 185 lbs.
9. A diagnostic test for a certain disease is available. In a given population, 1% of people actually have the disease. The test is such that:
 - If a person has the disease, the probability that the test gives a positive result is 0.95.
 - If a person does not have the disease, the probability that the test gives a positive result (false positive) is 0.02.

A person is chosen at random from the population and is tested. The result of the test comes out positive.

 - a) What is the probability that the chosen person actually has the disease?
 - b) What is the probability that the person does not have the disease even though the test is positive?
 - c) Comment on the reliability of the test when it shows a positive result.

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Total No. of Questions : 09

B.Sc Non Medical (Sem.-1)

MECHANICS-I

Subject Code : BSNM-104-18

M.Code : 75745

Date of Examination : 27-06-2025

Max. Marks : 50

Time : 3 Hrs.

INSTRUCTIONS TO CANDIDATES :

- SECTION-A is COMPULSORY consisting of TEN questions carrying ONE marks each.
- SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
- SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION - A**1. Write briefly :**

- What is meant by 'inertial frame'?
- Define Newton's second law of motion.
- State the principle of conservation of momentum.
- Give one example each of conservative and non-conservative force.
- What is the significance of Rutherford scattering?
- Write the expression for moment of inertia of a solid sphere.
- Define a 'rigid body'.
- Define elastic limit and breaking stress.
- Explain why a hollow cylinder is stronger than a solid cylinder of the same length, mass and material.
- What do you mean by angle of shear?

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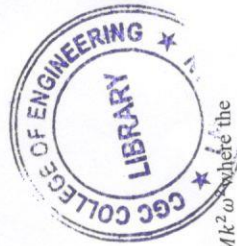
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SECTION - B

- Prove that a frame of reference moving with uniform translational acceleration with respect to an inertial frame is a non-inertial frame.
- A rocket of mass 20 kg has 180 kg of fuel. The exhaust velocity of fuel is 1.60 km s^{-1} . Calculate the ultimate vertical speed gained by the rocket when the rate of consumption of fuel is 2 kg s^{-1} .
- Explain laboratory and centre of mass system. What is the advantage of studying a collision in centre of mass system?
- Calculate the moment of inertia of a solid cylinder about axis of cylindrical symmetry.
- If Y , k and σ represent Young's modulus, Bulk modulus and Poisson's ratio, respectively, then prove that $k = \frac{Y}{3(1-2\sigma)}$.

SECTION - C

- What are Galilean transformations? Derive Galilean transformation equations for two, inertial frames. State and prove Galilean invariance.
- a) Derive an expression for the moment of inertia of a solid sphere :
 - About its diameter
 - About a tangent.
- Show that the kinetic energy of a rotating body about an axis is $\frac{1}{2} M k^2 \omega^2$ where the letters have their usual meaning.
- Discuss the motion of a symmetric top. Show that the projection of angular velocity describes a circle.



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Total No. of Pages : 02

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B.Sc.(Non Medical) (Sem.-2)
ELECTRICITY AND MAGNETISM
Subject Code : BSNM-204-18

M.Code : 76302

Date of Examination : 26-05-2025

Time : 3 Hrs.

Max. Marks : 50

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying ONE mark each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

1. Answer briefly:

- What are the properties of test charge?
- A charge $q_1 = 3 \mu\text{C}$ is located at the origin. Another charge $q_2 = 2 \mu\text{C}$ is placed at a distance 0.3 m from the origin along the X-axis. Find the location at which electric field is zero.
- Draw a graph showing the variation of electric field due to solid sphere.
- Define Magnetic permeability.
- Show that curl of gradient of scalar field is zero.
- Discuss the temperature dependence of magnetic susceptibility for paramagnetic materials.
- State Lenz's law.
- Why inductance is called electrical inertia?
- What is the importance of Poynting vector?
- What is an isotropic dielectric medium?

SECTION - B

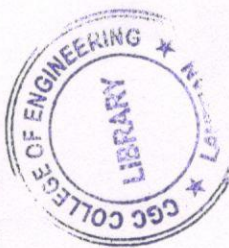
2. State and prove Gauss's theorem.
3. What are magnetic materials? Write a note on ferromagnetic materials.
4. What is self-induction? Define co-efficient of self-induction.
5. What is displacement current? Discuss the importance of displacement current.
6. The potential function at a point is given by $V(x, y, z) = 10(x^2 + y^2 + z^2)^{1/2}$. Find electric field intensity at point (2, 3, 3).

SECTION - C

7. What is an electric dipole? What is dipole moment? Calculate the electric field due to a dipole at a point on the equatorial line.
8. Use Biot and Savart's law to find an expression for magnetic field at a point on the axis of a current carrying solenoid. Hence prove that the magnetic field at the end is half the magnetic field at the center of a very long solenoid.
9. State Maxwell's equations and solve them to show that amplitude of electromagnetic wave is constant for non-conducting medium.



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B.Sc. (Non Medical) (Sem.-2)
THEORY OF EQUATIONS
Subject Code : BSNM-206-18

M.Code : 76304

Date of Examination: 03-06-2025

Time : 3 Hrs.

Max. Marks : 50

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is **COMPULSORY** consisting of **TEN** questions carrying **ONE** marks each.
2. SECTION-B contains **FIVE** questions carrying **FIVE** marks each and students have to attempt any **FOUR** questions.
3. SECTION-C contains **THREE** questions carrying **TEN** marks each and students have to attempt any **TWO** questions.

SECTION-A

1. Write briefly:
 - a. State Descartes's Rule of Sign.
 - b. Divide $2x^3 - 6x + 23 = 0$ by $x - 2$ by using synthetic division.
 - c. What is the product of roots of n degree polynomial in term of coefficients of that polynomial?
 - d. Diminish the roots of the equation $x^3 + 2x^2 + 3x - 1 = 0$ by 1.
 - e. Define errors and sources of errors.
 - f. Write 0.45867 in three digits form after decimal with explanation.
 - g. What do you mean by algorithms?
 - h. Number of significance figures in 0.0021000.
 - i. Explain discriminant for real cubic equations.
 - j. What is rate of convergence, describe it.

SECTION - B

2. Prove that every equation of the n^{th} degree has n roots and no more.
3. Use Newton-Raphson's Method to find a real root of $\cos x - xe^x = 0$ corrected to four decimal places.
4. Discuss the polynomial $3x^4 + 2x^3 - 10x^2 - 1 = 0$ by Descartes's rule of sign about its real and imaginary roots.
5. Differentiate between mean – absolute, relative and percentage error.
6. Solve the equation $28x^3 - 9x^2 + 1 = 0$ by Cardan's method.

SECTION - C

7. A real root of the equation $x^3 - 5x - 1 = 0$ lies in the interval $(0, 1)$. Perform four iterations of the Secant's method.
8. Two roots of the equation $x^4 + 6x^3 - 16x^2 + 24x - 80 = 0$ are purely imaginary. Find them.
9. Find the root of the equation $f(x) = x^2 - 4$ within the interval $[1, 3]$ and with a tolerance of 0.1. How much iteration is needed to approximate the root using the bisection method?

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B.Sc. (Non Medical) (Sem.-3)

ORGANIC CHEMISTRY-II

Subject Code : BSNM-301-18

M.Code : 76900

Date of Examination : 03-07-2025

Max. Marks : 60

Time : 3 Hrs.

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is **COMPULSORY** consisting of TEN questions carrying **TWO** marks each.
2. SECTION-B contains **FIVE** questions carrying **FIVE** marks each and students have to attempt any **FOUR** questions.
3. SECTION-C contains **THREE** questions carrying **TEN** marks each and students have to attempt any **TWO** questions.

SECTION - A

1. **Write briefly:**
 - a. What do you mean by Huckle's rule?
 - b. What do you mean by SN2 reaction?
 - c. Explain the Claisen rearrangement.
 - d. Explain Wolff-Kishner reaction.
 - e. Define the Huckle's rule.
 - f. What do you mean by acidic nature of alcohol?
 - g. Explain the two chemical properties of alcohols.
 - h. Define the activating group.
 - i. Define the resonance.
 - j. Explain one method of formation of carboxylic acid.

SECTION - B

2. Explain the Fries rearrangement.
3. Explain the Claisen rearrangement.
4. Explain the three reactions of formation of phenol.
5. What are the reagents used in the Mannich reaction? Explain the reaction.
6. Explain the Friedel-Crafts reaction.

SECTION - C

7. Explain the mechanism of halogenations and sulphonation of benzene.
8. Explain the orientation and ortho/para ratio of benzene.
9. Explain the Cannizzaro reaction.



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B.Sc. (Non-Medical) (Sem.-3)

DIFFERENTIAL EQUATIONS

Subject Code : BSNM-306-18

M.Code : 76905

Date of Examination : 18-06-2025

Time : 3 Hrs.

Max. Marks : 50

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is **COMPULSORY** consisting of **TEN** questions carrying **ONE** mark each.
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3. SECTION-C contains **THREE** questions carrying **TEN** marks each and students have to attempt any **TWO** questions.

SECTION - A

1. Write briefly :
 - a) Check whether the given equation $(x^2 - ay) dx = (-y^2 + ax)$ is exact.
 - b) Solve $(D^4 + D^4)z = 0$
 - c) Solve $p = \log (px - y)$
 - d) State the necessary and sufficient condition for exact differential equation.
 - e) Find C.F of $4x^2y'' + y = 0$.
 - f) Define Cauchy's linear differential equation.
 - g) State geometric meaning of differential equation.
 - h) State orthogonal trajectories.
 - i) Solve $xdy + ydx = 0$.
 - j) State Clairaut's equation.

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SECTION - B

2. Solve the following differential equations :

$$(x^2y^2 + xy + 1)ydx + (x^2y^2 - xy + 1)xdy = 0$$

3. Solve: $[(3x + 2)^2 D^2 + 3(3x + 2)D - 36]y = 3x^2 + 4x + 1$

4. **Solve:** $(y+z)p - (x+z)q = x - y$

5. Solve: $(D^2 + 2DD' - 8D'^2)z = \sqrt{2x + 3y}$.

6. Form the partial differential equation from $2z = \frac{x^2}{a^2} + \frac{y^2}{b^2}$.

SECTION - C

7. Solve $(p^2 + q^2)y = qz$ using Charpit's methods
8. Solve $y'' - 6y' + 9y = \frac{e^{3x}}{x^2}$, using method of variation of parameters.
9. Solve $y + px = p^2 x^4$



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Total No. of Pages : 02

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B.Sc. (Non Medical) (Sem.-4)

ORGANIC CHEMISTRY-III

Subject Code : BSNM402-18

M.Code : 77680

Date of Examination : 20-05-2025

Time : 3 Hrs.

Max. Marks : 50

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying ONE marks each.
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3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION - A

1. Write briefly :
 - a) What is nucleophile?
 - b) Give two examples of electrophile.
 - c) Explain the acidic behavior of carboxylic acids.
 - d) Explain the term HVZ reaction.
 - e) Give one method of formation of aldehyde.
 - f) Define the term esterification.
 - g) Explain the structure of pyridine.
 - h) Define amines.
 - i) What is the structure of Furan?
 - j) Give one example of formation of organolithium

SECTION - B

2. Explain the chemical properties of ethers.
3. Explain the Grignard reagent chemical reaction.
4. Explain organo copper compounds and their method of formation.
5. What are Phase transfer catalysts?
6. Explain the acylation of carboxylic acids.

SECTION - C

7. What are the physical properties of primary, secondary and tertiary amines?
8. Explain the molecular orbital diagram of pyrrole.
9. Explain the Gabriel-phthalimide reaction with mechanism.



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Roll No.

Total No. of Questions : 09

Total No. of Pages : 02

B.Sc. (Non Medical) (Sem.-4)
ANALYSIS-II

Subject Code : BSNM405-18

M.Code : 77683

Date of Examination: 31-05-2025

Time : 3 Hrs.

Max. Marks : 50

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is **COMPULSORY**.
SECTION-A is **COMPULSORY** consisting of **TEN** questions carrying **ONE** mark each.
2. SECTION-B contains **FIVE** questions carrying **FIVE** marks each and students have to attempt any **FOUR** questions.
3. SECTION-C contains **THREE** questions carrying **TEN** marks each and students have to attempt any **TWO** questions.

SECTION-A

1. Write briefly:

- Show that the series $\sin x + \frac{\sin 2x}{2^2} + \frac{\sin 3x}{3^2} + \dots$ converges uniformly on $\mathbf{R}$.
- Show that the sequence $\{f_n\}$ where $f_n(x) = \frac{x^n}{1+x^n}$ converges uniformly on $[0, \frac{1}{2}]$.
- State Weierstrass approximation theorem.
- Use M_n — test to show that 0 is the point of non-uniform convergence of sequence $\{f_n\}$ where $f_n(x) = nxe^{-nx^2}$, $x \in \mathbf{R}$.
- Find the divergence of vector field $\mathbf{v} = (x^2y^2 - z^3)\mathbf{i} + 2xyz\mathbf{j} + e^{xyz}\mathbf{k}$.
- Prove that $\text{div}(\mathbf{f}) = \mathbf{f}(\text{div } \mathbf{v}) + (\text{grad } \mathbf{f}) \cdot \mathbf{v}$ where $\mathbf{f}$ is scalar function.
- Compute grad f where $f(x, y, z) = e^{x^2y^2z}$. Also verify $\text{curl}(\text{grad } f) = 0$.
- If $\mathbf{F} = (3xy - 6x^2)\mathbf{i} + (2y - 4x)\mathbf{j}$, evaluate $\int_C \nabla f \cdot d\mathbf{r}$ where C is curve in xy plane $y = x^3$ from $(1, 1)$ to $(2, 8)$.
- Obtain the half range sine series for $f(x) = 2x$ in $0 < x < 1$.
- What do you mean by Fourier series?

SECTION - B

2. Show that the sequence $\{f_n(x)\}$ where $f_n(x) = e^{inx}$ is uniformly convergent on $[a, b]$ but only pointwise convergent on $[0, b]$.
3. Show that the series $\sum_{n=1}^{\infty} \frac{\sin nx}{n^3}$ is differentiable for every x and its derivative is $\sum_{n=1}^{\infty} \frac{\cos nx}{n^2}$.
4. Test for uniform convergence and continuity of sum function of series $\sum_{n=1}^{\infty} xe^{-nx}$ on $[0, 1]$.
5. Find fourier series expansion of $f(x) = e^{ax}$ on $(-\pi, \pi)$.
6. State and prove Gauss divergence theorem

SECTION - C

7. Use Dirichlet's test to show that the series $\sum_{n=1}^{\infty} \frac{(-1)^n}{n+x^2}$ is uniformly convergent for all values of x .
8. Verify Green's theorem in the plane for the integral $\int_C (2xy - x^2) dx + (x^2 + y^2) dy$ where C is the boundary of region enclosed by $y = x^2$ and $y^2 = x$.
9. Find the Fourier series to represent the function $f(x)$ given by

and deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots = \frac{\pi^2}{6}$

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Total No. of Pages : 02

Total No. of Questions : 09

B.Sc. (Non-Medical) (Sem.-5)

ELEMENTS OF MODERN PHYSICS

Subject Code : BSNM-503-18

M.Code : 78617

Date of Examination: 26-06-2025

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

1. Write briefly :
 - a) Calculate the frequency and wavelength of a photon whose energy is 25 eV.
 - b) What do you mean by 'Compton Wavelength'?
 - c) What is the problem with Rutherford model?
 - d) What do you mean by 'Stationary State'?
 - e) Define 'Matter Waves'.
 - f) What do you mean by 'Quantum Dot'?
 - g) What is the outcome of Stern Gerlach experiment?
 - h) Define the term 'massless particle'.
 - i) What are the postulates of Special Theory of Relativity?
 - j) What is the rest mass of photon?

SECTION-C

7. Describe with necessary theory, Davisson and Germer experiment for establishing wave nature of the electron.
8. What do you mean by spin orbit coupling? Calculate the change in total energy of the atom due to spin orbit coupling
9. Describe Michelson-Morley experiment and obtain the expected fringe shift under classical assumptions. What efforts were made to explain the null results of Michelson-Morley experiment on the basis of ether hypothesis.



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Total No. of Pages : 02

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Roll No.

Total No. of Questions : 09

B.Sc (Non Medical) (Sem.-5)

THEORY OF PROBABILITY

Subject Code : BSNM-505-18

M.Code : 78619

Date of Examination : 21-06-2025

Max. Marks : 50

Time : 3 Hrs.

INSTRUCTIONS TO CANDIDATES :

- SECTION-A is COMPULSORY consisting of TEN questions carrying ONE mark each.
- SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
- SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION - A

1. Write briefly :

- Define conditional probability.
- If A & B are independent events, then show that $A \cap B$ are also independent.
- A random variable X assumes the values -1, 0 & 1 with probabilities $1/3, 1/2$ & $1/6$ respectively. Find distribution of X.
- The diameter of an electric cable say X is assumed to be a continuous random variable with p.d.f $f(x) = 6x(1-x), 0 \leq x \leq 1$. Check that $f(x)$ is p.d.f or not.
- Define Expectation of a random variable.
- Explain properties of Poisson distribution.
- Write any two importance of Normal Distribution.
- What do you mean by Beta Distribution?
- Prove that for every event A, $0 \leq P(A) \leq 1$.
- Define Addition and multiplication theorem of Expectation.

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SECTION - B

2. The distribution function for a random variable X is :

$$F(x) = \begin{cases} 1 - e^{-2x} & x \geq 0 \\ 0 & x < 0 \end{cases}$$

Find density function, the probability that $X > 2$.

- In a certain high school consisting of 60 girls and 40 boys, it is observed that 24 girls and 16 boys wear eye glasses. A student is picked at random from this class. Find the probability that the student wear eye glasses and given that student is a boy.
- A coin is tossed until a Head appears. What is the expectation of the number of the tosses required?
- Ten coins are thrown simultaneously. Find the probability of getting at least seven heads.
- Define Beta distribution of second kind. Obtain its mean and variance.

SECTION - C

7. Let X and Y be independent random variables each having poisson distribution with parameters λ_1 and λ_2 . Show that the conditional distribution of X, given $X + Y$ is binomial.

8. The following data are the number of seeds germinating out of 10 on damp filter paper for 80 sets of seeds. Fit a binomial distribution to this data :

No. of Seeds (x):	0	1	2	3	4	5	6	7	8	9	10
Frequency (f):	6	20	28	12	8	6	0	0	0	0	0

- A and B are independent events. The probability that both A and B occur $1/6$ and the probability that neither of them occur is $1/3$. Find the probability of occurrence of A.



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Roll No.

Total No. of Questions : 09

Total No. of Pages : 02

B.Sc. (Non – Medical) (Sem.-6)
DRUG ABUSE – II (MANAGEMENT AND PREVENTION)

Subject Code : BSNM-609-18

M.Code : 79502

Date of Examination : 10-06-2025

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES:

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION - A

I. Write briefly :

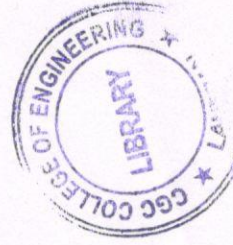
- a. What is the significance of family support in deterring drug abuse?
- b. What is Active Scrutiny?
- c. What is supervision?
- d. What is Drug dependence?
- e. Define Addictive.
- f. Define time-bound trials.
- g. Define statutory warnings.
- h. What is the NDP Act?
- i. What is counseling?
- j. Define Motivation.

SECTION – B

2. Write a short note on strict enforcement of the law.
3. What is the role of professional coordination in random testing on students?
4. Discuss the benefits of parent-teacher-health professional coordination in drug abuse prevention.
5. Provide an in-depth analysis of the NDPs Act and its role in drug abuse control.
6. How can statutory warnings contribute to controlling drug abuse?

SECTION - C

7. Explain how the media can be a powerful tool in raising awareness about drug abuse and its consequences.
8. Discuss the importance of campaigns, educational programs and media control in preventing drug abuse.
9. Write a detailed note on different awareness programs conducted by the Government to control the misuse of drugs.



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SECTION-B

2. Prove that the set of positive integers which are less than n and co-prime to n forms an abelian group under the operation of multiplication modulo n .
3. Prove that the group G is equal to the union of all right cosets of H in G . Where H is subgroup of group G .
4. Prove that a group G is abelian if and only if the mapping $f: G \rightarrow G$ defined by $f(x) = x^{-1}$ is an automorphism.
5. Prove that $I + J$ is an ideal of R and $+J = \langle \cup J \rangle$, is smallest ideal of R containing $\cup J$. Where I and J be any two ideals of a ring R .
6. Prove that the relation of isomorphism in the set of all rings is an equivalence relation.

SECTION-C

7. Prove that $G = a_1^{-1}H \cup a_2^{-1}H \cup \dots \cup a_n^{-1}H$ be a decomposition of G into left cosets of H , where H is subgroup of group G and $G = Ha_1 \cup Ha_2 \cup \dots \cup Ha_n$ be a decomposition of G into disjoint right cosets of H .
8. State and prove First Theorem of Isomorphism for Group G .
9.
 - a) State and prove Fundamental theorem of Ring Homomorphism.
 - b) Prove that a commutative ring R with identity is simple if and only if R is field.

SECTION-A

1. Answerbriefly :

- What is group? Give one example.
- What is meaning of cosets of subgroup?
- Explain conjugate element in a group with example.
- What is alternating group? Is A_7 is simple group or not?
- Explain Homomorphism in a group with example.
- What is Ring? Give two examples.
- Explain Integral Domains with example.
- What is Maximal ideal? Write all maximal ideals of a field F .
- State third isomorphism theorem for rings.
- Write a note on Quotient rings.

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Total No. of Pages : 02

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B.Sc (Non-Medical) (Sem.-6)

MODERN ALGEBRA

Subject Code :BSNM605-18

M. Code : 79497

Date of Examination :29-05-2025

Max. Marks :50

Time : 3 Hrs.

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying ONE marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

1. Answer briefly :
 - a) What is group? Give one example.
 - b) What is meaning of cosets of subgroup?
 - c) Explain conjugate element in a group with example.
 - d) What is alternating group? Is A_7 is simple group or not?
 - e) Explain Homomorphism in a group with example.
 - f) What is Ring? Give two examples.
 - g) Explain Integral Domains with example.
 - h) What is Maximal ideal? Write all maximal ideals of a field F .
 - i) State third isomorphism theorem for rings.
 - j) Write a note on Quotient rings.

SECTION-B

2. Prove that the set of positive integers which are less than n and co-prime to n forms an abelian group under the operation of multiplication modulo n .
3. Prove that the group G is equal to the union of all right cosets of H in G . Where H is subgroup of group G .
4. Prove that a group G is abelian if and only if the mapping $f: G \rightarrow G$ defined by $f(x) = x^{-1}$ is an automorphism.
5. Prove that $I + J$ is an ideal of R and $+J = \langle \bigcup J \rangle$, is smallest ideal of R containing $\bigcup J$. Where I and J be any two ideals of a ring R .
6. Prove that the relation of isomorphism in the set of all rings is an equivalence relation.

SECTION-C

7. Prove that $G = a_1^{-1}H \cup a_2^{-1}H \cup \dots \cup a_r^{-1}H$ be a decomposition of G into left cosets of H , where H is subgroup of group G and $G = Ha_1 \cup Ha_2 \cup \dots \cup Ha_r$ be a decomposition of G into disjoint right cosets of H .
8. State and prove First Theorem of Isomorphism for Group G .
9.
 - a) State and prove Fundamental theorem of Ring Homomorphism.
 - b) Prove that a commutative ring R with identity is simple if and only if R is field.



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Total No. of Questions : 09

Total No. of Pages : 02

B.Sc. (Non - Medical)(Sem.-6)

SOLID STATE PHYSICS

Subject Code : BSNM603-18

M.Code : 79495

Date of Examination : 22-05-2025

Time : 3 Hrs.

Max. Marks : 50

INSTRUCTIONS TO CANDIDATES :

- SECTION-A is COMPULSORY consisting of TEN questions carrying ONE marks each.
- SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
- SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION - A**1. Write briefly :**

- What do you mean by geometrical structure factor?
- Outline the construction process for Brillouin Zone.
- Define Lenard-Jones Potential.
- Explain the Madelung constant.
- What are the assumptions of Drude-Lorentz theory?
- Why X-rays are used for crystal structure determination?
- Brief about Weigner Seitz approximation for constructing the unit cell.
- A crystal plane has intercept $6a$, $-2b$ and $4c$. Find the Millar indices of the crystal plane.
- What are different types of bonding in crystal?
- What is Born Haber cycle?

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SECTION - B

- Show that reciprocal lattice of fcc lattice is bcc lattice.
- Obtain the diffraction condition in reciprocal lattice system.
- What is the effect of temperature on f-d distribution?
- Derive an expression for electronic specific heat.
- Determine the density of CsCl system, which crystallizes into bcc structure, with edge length of 412.1 pm. The atomic mass of Cs and Cl are 133 and 35.5 g mol⁻¹, respectively.

SECTION - C

- Discuss in detail the nearly free electron model. Discuss the concept of density of states.
- Discuss electrical and thermal conductivity of metals. Derive expression for thermal and electrical conductivity and relation between them.
- Discuss quantization of lattice vibrations and hence explain the concept of phonon. Also, discuss inelastic scattering of phonon.



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Roll No.

Total No. of Pages : 02

Total No. of Questions : 09

B.Sc. (Non – Medical) (Sem.-6)

PHYSICAL CHEMISTRY-IV

Subject Code : BSNM602-18

M.Code : 79494

Date of Examination : 19-05-2025

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION - A**1. Write briefly :**

- a) What is the Planck's radiation law?
- b) What do you mean by the Heisenberg's uncertainty principle?
- c) What do you mean by physical interpretation of wave function?
- d) What do you mean by Grothus-Drapper Law?
- e) Explain the Fluorescence.
- f) Explain the Bragg's equation.
- g) What do you mean by high quantum yield?
- h) What do you mean by Hamiltonian operator?
- i) Difference radial and angular part.
- j) What do you mean by Stark-Einstein law?

SECTION - B

2. Explain the Jablonski diagram.
3. Difference between thermal and photochemical processes.
4. Explain the radial description functions of 3p and 3d.
5. Explain the Bohr's model of hydrogen atom.
6. Write a short note on X-ray diffraction by crystals.

SECTION - C

7. Explain the postulates of quantum mechanics.
8. Derivation of Bragg's in reciprocal space.
9. Explain the importance of Schrodinger wave equation.



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Total No. of Pages : 02

Total No. of Questions : 09

B.Sc. (Non-Medical) (Sem.-6)
ORGANIC CHEMISTRY-IV
Subject Code : BSNM601-18

M.Code : 79493

Date of Examination : 05-05-2025

Time : 3 Hrs.

Max. Marks : 50

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying ONE mark each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION - A

1. Write briefly :
 - a. Define chemical shift in NMR spectroscopy.
 - b. What is nuclear shielding and deshielding in ^1H NMR?
 - c. Write the Beer-Lambert law and its significance.
 - d. What are chromophores and auxochromes in UV spectroscopy?
 - e. State Hooke's law in IR spectroscopy.
 - f. Define free radical vinyl polymerization.
 - g. What is phenol-formaldehyde resins used for?
 - h. Name two naturally occurring polysaccharides.
 - i. What is keto-enol tautomerism?
 - j. Define the isoelectric point of an amino acid.

SECTION - B

2. Explain spin-spin splitting in proton NMR spectroscopy with an example.
3. Describe the effects of conjugation on UV absorption spectra.
4. Explain the classification of polymers based on polymerization mechanisms.
5. Describe the structure and formation of sulphonic acids.
6. Discuss the inter-conversion of glucose and fructose.

SECTION - C

7. Elucidate the structure of ethyl acetate using UV, IR, and NMR spectroscopy.
8. Explain the peptide bond formation and different levels of protein structure.
9. Describe the double helical structure of DNA and its importance.

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Roll No.

Total No. of Pages : 02

Total No. of Questions : 09

B.Sc. (Non-Medical) (Sem.-6)

ORGANIC CHEMISTRY-IV

Subject Code : BSNM601-18

M.Code : 79493

Date of Examination : 05-05-2025

Time : 3 Hrs.

Max. Marks : 50

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying ONE mark each.
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3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION - A

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- a. Define chemical shift in NMR spectroscopy.
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- e. State Hooke's law in IR spectroscopy.
- f. Define free radical vinyl polymerization.
- g. What is phenol-formaldehyde resins used for?
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- i. What is keto-enol tautomerism?
- j. Define the isoelectric point of an amino acid.

SECTION - B

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5. Describe the structure and formation of sulphonic acids.
6. Discuss the inter-conversion of glucose and fructose.

SECTION - C

7. Elucidate the structure of ethyl acetate using UV, IR, and NMR spectroscopy.
8. Explain the peptide bond formation and different levels of protein structure.
9. Describe the double helical structure of DNA and its importance.



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