Total No. of Printed Pages:2

SUBJECT CODE NO: - YNP-2645
FACULTY OF SCIENCE AND TECHNOLOGY
B.Sc. (NEP) (P-2024) F.Y Sem I
Examination April / May 2025
Mathematics Calculus

[Time: 1:00 Hours] **[Max. Marks:30]**

Please check whether you have got the right question paper.

N. B
1) Q.1 is compulsory.
2) Attempt any four questions from Q.2 to 7.

Q1 Choose the correct alternative **10**

1. If $y = \cosh(x)\,; x \in R$ then $\frac{dy}{dx}$ =------------
   a) cosh (x) b) –cosh (x) c) sinh (x) d) –sinh (x)

2. For all $x \in R, e^x$ =---------
   a) $1 + x + \frac{x^2}{2!} + \cdots + \frac{x^n}{n!}$ b) $1 - x - \frac{x^2}{2!} - \cdots - \frac{x^n}{n!}$
   c) $x + \frac{x^2}{2!} + \cdots + \frac{x^n}{n!}$ d) $x - \frac{x^2}{2!} + \cdots - \frac{x^n}{n!}$

3. If $z = f(x,y)$ be a homogeneous function of x,y of degree n, then $x^2\frac{\partial^2 z}{\partial x^2} + 2xy\frac{\partial^2 z}{\partial x \partial y} + y^2\frac{\partial^2 z}{\partial y^2}$ = --------
   a) z b) n(n – 1)z c) nz d) -nz

4. The area of the one arc of the cycloid $x = a(\theta - sin\theta), y = a(1 - cos\theta)$ and its base is ------------
   a) $3a^2$ b) 3π c) $3a^2\pi$ d) πa^2

5. The volume of the solid obtained by revolving the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ about axis of x is ---------
   a) $\pi\, ab^2$ b) $\frac{\pi\, ab^2}{2}$ c) $\frac{4}{3}\,\pi\, ab^2$ d) $\pi\, ab$

Q2 If u and ϑ be two functions of x possessing derivatives of the n[th] order, then prove that $(u\vartheta)_n = u_n v + n\,c_1 u_{n-1} v_1 + nc_2\, u_{n-2} v_2 + \cdots + nc_r u_{n-r}\, v_r + \cdots + n\, c_n u\, v_n$. **05**

Q3 Find the n[th] derivative of $y = \frac{x^2}{(x+2)(2x+3)}$. **05**

Q4 If $z = f(x.y)$ be a homogeneous function of x,y of degree n, then prove that 05

$$x\frac{\partial z}{\partial x} + y\frac{\partial z}{\partial y} = nz$$

Q5 If in the Cauchy's mean value theorem, $f(x) = e^x$ and $F(x) = e^{-x}$, show that 'e' is arithmetic mean between a and b. 05

Q6 Rectify the curve $x = a(\theta + sin\theta)\ y = a(1 - \cos\theta)$ 05

Q7 If A is the vertex, 0 the centre and P(x,y) a point on the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$, then prove that $x = a\cosh\left(\frac{2s}{ab}\right), y = b\sinh\left(\frac{2s}{ab}\right)$ 05

Where S is the sectorial area OPA.

Total No. of Printed Pages:2

SUBJECT CODE NO: - GOE-8862
FACULTY OF SCIENCE AND TECHNOLOGY
B.Sc. (GOE) (NEP) (PATTERN -2024) SEM I
Examination April / May 2025
Mathematics (Business Mathematics-I)

[Time: 1:00 Hours] **[Max. Marks:30]**

Please check whether you have got the right question paper.

N. B
1) Question No.1 is compulsory.
2) Attempt any four questions from question No. 2 to 7 .

Q1 Choose the correct alternative **10**

i. Selling price = --------------
   a) Cost + Markup b) Cost – Markup
   c) Markup – cost d) None of these

ii. Ratio = ---------
   a) $\frac{Profit}{sales}$ b) Profit – sales
   c) profit + sales d) $\frac{Sales}{Profit}$

iii. A function is linear if the graph of the function forms a ------
   a) Curve b) Circle
   c) Straight line d) Ellipse

iv. Profit = ---------
   a) Revenue + cost b) Revenue ÷ sales
   c) Revenue + sales d) Revenue – Expenses

v. Gross profit = ----------
   a) Sales + COGS b) Sales – COGS
   c) Sales – cost + net profit d) Sales + net profit

Q2 A jewellery store's sales and expenses are given below for the months of October , November and December. **5**

Month	October	November	December
Sales	$ 40 , 000	$ 59 ,000	$ 109,000
Expenses (all)	$38 , 000	$ 50,000	$ 84,000

Find the profits and percent net margin for each month.

Q3 If to make 1000 posters, it would cost \$ 190 and to make 1500 posters, it would cost \$ 245 , then find linear equation for cost of poster printing in terms of number of posters. 5

Q4 If the exchange rate is \$ 2.10 per British pound , then find the value of 300 British pound. 5

Q5 Ocean Marina rents moorage space for boats. It's charge for boats between 20 and 40 feet long is \$ 180 plus \$ 12 a foot. Let x = boat length in feet, c= cost of moorage 5

X	20	24	28	32	36	40
C	-----	-----	---	---	---	---

Complete the above table relating length and cost.

Q6 Solve the following system of equations for x and y : 5

$Y - 4x = 6$

$2x + 3y = 4$

Q7 Solve the following system of linear equations by method of elimination 5

$h + 0.5\,g = 3500$

$h + 1.5\,g = 4500$

Total No. of Printed Pages:2

SUBJECT CODE NO: - YNP-2665
FACULTY OF SCIENCE AND TECHNOLOGY
B.Sc. (NEP) (P-2024) F.Y Sem II
Examination April / May 2025
Mathematics - Differential Equations

[Time: 1:00 Hours] **[Max. Marks:30]**

Please check whether you have got the right question paper.

N. B
1) Question No. 1 is compulsory.
2) Attempt any four questions from question no. 2 to 7.
3) Figures to the right indicate full marks.

Q1 Choose the correct alternative: **10**

1. The number of arbitrary constants in the general solution of second order differential equation are......
   (a) Zero (b) Two (c) Three (d) Four

2. If the integrating factor of the differential equation $\frac{dy}{dx} + Py = Q$ is x, then P = --
   (a) $\frac{1}{x}$ (b) x (c) e^x (d) $logx$

3. If X is any function of x, then $\frac{1}{D-a} X$ =---------
   (a) $e^{-ax} \int e^{ax} X\, dx$ (b) $e^{ax} \int e^{-ax} X\, dx$
   (c) $e^{ax} \int X\, dx$ (d) $e^{ax} \int e^{ax} X\, dx$

4. If $\frac{d^2y}{dx^2} - m^2y = 0$, then ----------
   (a) $y = (c_1 + c_2x)$ (b) $y = e^{mx}(c_1 + c_2x)$
   (c) $y = c_1e^{mx} + c_2e^{-mx}$ (d) None of these

5. Particular integral of the differential equations $x^2\frac{d^2y}{dx^2} + 5x\frac{dy}{dx} + 4y = x^4$ is ----
   (a) $\frac{x^4}{5}$ (b) $\frac{x^4}{8}$ (c) $-\frac{x^4}{36}$ (d) $\frac{x^4}{36}$

Q2 Reduce the differential equation **05**

$$\frac{dy}{dx} + Py = Q\, y^n$$

to the linear form, where P and Q are functions of x.

Q3 Solve: **05**

$$(x^2 - 4xy - 2y^2)dx + (y^2 - 4xy - 2x^2)dy = 0$$

Q4 With usual notations, Prove that: **05**

$\frac{1}{\phi(D^2)}\cos ax = \frac{1}{\phi(-a^2)}\cos ax$, where $\phi(-a^2) \neq 0$

Q5 Solve: $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = 2e^{2x}$ **05**

Q6 Find the complementary function of the differential equation **05**

$x^n\frac{d^n y}{dx^n} + P_1 x^{n-1}\frac{d^{n-1}y}{dx^{n-1}} + --- + P_n Y = X,$

Where $P_1, P_2, \dots, P_n$ are constants and X is a function of x.

Q7 Solve: $x^2\frac{d^2y}{dx^2} + 7x\frac{dy}{dx} + 5y = x^5.$ **05**

Total No. of Printed Pages: 02 GOE-8950

SUBJECT CODE NO: - GOE-8950
FACULTY OF SCIENCE AND TECHNOLOGY
B.Sc. (GOE) (NEP) (PATTERN -2024) SEM II
Examination April / May 2025
Mathematics (Matrices)

[Time: 1.00 Hours] **[Max. Marks: 30]**

N. B

Please check whether you have got the right question paper.
1) question no. 1 is compulsory
2) attempt any Four questions from questions no. 2 to 7
3) figures to the right indicates full marks.

Q1 **Choose the correct alternative.** **10**

1. A row matrix has only ____
   a) One element
   b) One row with one or more columns
   c) One column with one or more rows
   d) One row with one elements

2. If $\begin{bmatrix} 5 & k+2 \\ k+1 & -2 \end{bmatrix} = \begin{bmatrix} k+3 & 4 \\ 3 & -k \end{bmatrix}$ then the volume of k is ____.
   a) 0 b) 2 c) -2 d) 1

3. If A and B are herniation matrices, then BAB' is ____.
   a) Hermitian b) skew Hermitian c) symmetric d) skew symmetric

4. The rank of the unit matrix of order n is ____.
   a) N-1 b) n c) n+1 d) n^2

5. If the number of variables in a non-homogeneous system AX=B is n, then the system possesses a unique solution of____
   a) $\varrho(A) < \varrho[A,B]$ b) $\varrho(A) = \varrho[A,B]$=n
   c) $\varrho(A) > \varrho[A,B]$ d) none of these

Q2 Prove that the cancellation Laws hold good in the case of addition of matrices. **05**

Q3 If $A = \begin{bmatrix} 1 & 2 \\ 3 & -4 \end{bmatrix}, B = \begin{bmatrix} 2 & -7 \\ 5 & 8 \end{bmatrix}, C = \begin{bmatrix} 1 & 5 \\ 0 & 2 \end{bmatrix}$ then find $A + B - C$ **05**

Q4 show that if A and B are symmetric and commute, then $A^{-1}B$ is symmetric. **05**

Q5 Find the inverse of the matrix $A = \begin{bmatrix} 2 & 3 \\ 4 & -1 \end{bmatrix}$ **05**

Q6 If A is an $n \times n$ matrix then prove that $|\,adj\ A\,| = |A|^{n-1}$ **05**

Q7 Show that the equations **05**

$$2x + 6y + 11 = 0$$
$$6x + 20y - 6z + 3 = 0$$
$$6y - 18z + 1 = 0$$

Are not consistent.

SUBJECT CODE NO: YY-2526
FACULTY OF SCIENCE AND TECHNOLOGY
B.Sc. (CBCGS)(Pattern 2022) S.Y SEM IV
Examination May 2025
Mathematics-X Partial Differential Equations

[Time:1:30 Hours] **[Max. Marks: 40]**

N. B
Please check whether you have got the right question paper.
1) All questions are compulsory.
2) Figure to the right indicate full marks

Q1 Choose the correct alternatives **10**

1) The operators DZ and $D'Z$ are defined respectively by

a) $\frac{\partial z}{\partial Y}$ and $\frac{\partial z}{\partial x}$ b) $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial Y}$ c) $\frac{\partial^2 z}{\partial x^2}$ and $\frac{\partial^2 z}{\partial Y^2}$ d) $\frac{\partial^2 z}{\partial Y^2}$ and $\frac{\partial^2 z}{\partial x^2}$

2) The partial differential equation formed by eliminating arbitrary function from $z = f(x^2 - y^2)$ is

a) $z = pq$ b) $yp + xq = 0$ c) $yp - xq = 0$ d) $xp = 0$

3) The axillary equation for the equation $xp + yq = z$ are

a) $dx = dy = dz$ b) $dx = -dy = -dz$

c) $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$ d) $\frac{dx}{x} = \frac{dy}{y} = \frac{dz}{z}$

4) The equation $p^2 + q^2 = 1$ is of the form

a) $f(p,q) = 0$ b) $f(z,p,q) = 0$

c) $f(x,p) = q(y,q)$ d) $f(x,y,z,p) = 0$

5) The particular integral of equation $(D^3 - 3D^2D' + 4D'^3)Z = e^{x+2y}$ is

a) e^{x+2y} b) $\frac{e^{x+2y}}{27}$ c) $27\, e^{x+2y}$ d) e^{x-2y}

Q2 A] Attempt any one **08**

a) Obtain subsidiary equations for the Lagrange's linear partial differential equation

b) Explain the charpit's methods to solve the partial differential equation

6

B] Attempt any one 07

a) Solve $x(z^2 - y^2)\frac{\partial z}{\partial x} + y(x^2 - z^2)\frac{\partial z}{\partial y} = z(y^2 - x^2)$

b) Solve $\frac{\partial^3 z}{2x^3} - 4\frac{\partial^3 z}{\partial x^2 \partial y} + 4\frac{\partial^3 z}{\partial x \partial y2} = 2\sin(3x + 2y)$

Q3 A] Attempt any one 08

a) Explain the solution of wave equation by D' Alembert's method

b) Explain the method of finding the particular integral of homogeneous partial differential Equation $f(D, D')z = e^{ax+by}$

B] Attempt any one 07

a) Solve $(D - 3D' - 2)^2 z = 2\,e^{2x}\sin(y + 3x)$

b) The ends A and B of a rod 20cm long have the temperature at 30^0c and at 80^0c until steady state prevails. The temperature of the ends are changed at 40^0c and 60^0c respectively. Find the temperature distribution in the rod at time t?

SUBJECT CODE NO: - YY-2527
FACULTY OF SCIENCE AND TECHNOLOGY
B.Sc. (CBCGS) (Pattern 2022) S.Y SEM IV
Examination May 2025
Mathematics-XI Numerical Analysis

[Time: 1.30 Hours] **[Max. Marks:40]**

N. B

Please check whether you have got the right question paper.
1) All questions are compulsory.
2) Draw diagram whenever necessary.
3) Use Only blue or black pen for writing.

Q1 Choose correct alternative: - **10**

1. It h is the interval of differencing then $E(e^x) =$ ________

a. e^x b. e^h c. e^{x-h} d. e^{x+h}

2. The first divided difference of $f(x)$ for the two arguments x_0, x_1 is defined as ____

a. $f(x_0) - f(x_1)$ b. $f(x_1) - f(x_0)$

c. $\frac{f(x_0)-f(x_1)}{x_0-x_1}$ d. $\frac{1}{x_0-x_1}$

3. If h is the interval of differencing then $\delta\left(x + \frac{1}{2}h\right) =$ ________

a. $f(x+h) - f(x)$ b. $f(x+h) + f(x)$

c. $f(x+h)$ d. $f(x)$

4. The relation between two operators μ and E is ________

a. $\mu \equiv \frac{1}{2}\left(E^{\frac{1}{2}} + E2^{\frac{-1}{}}\right)$ b. $\mu \equiv \frac{1}{2}\left(E^{\frac{1}{2}} + E^{\frac{-1}{2}}\right)$

c. $\mu \equiv \frac{1}{2.} E^{\frac{1}{2}}$ d. $\mu \equiv \frac{1}{2} E^{\frac{-1}{2}}$

5. The (n+1)th differences of a polynomial of the nth degree are ___________

a. Nonzero b. Zero

c. Not defined d. None of above

Q2 (A) Attempt any one: **08**

a) Derive Newton-Gregory formula for backward interpolation.

b) Derive Lagrange's Interpolation formula for unequal intervals

(B) Attempt any one **07**

a) Use the method of separation of symbols to prove the following identity

$$u_x = u_{x-1} + \Delta u_{x-2} + \Delta^2 u_{x-3} + \text{-------} + \Delta^{n-1} u_{x-n} + \Delta^n u_{x-n}$$

b) By means of Newton's divided difference formula, find the values of f(2), f(8) and f(15) from the following table:

x	4	5	7	10	11	13
F(x)	48	100	294	900	1210	2028

Q3 (A) attempt any one **08**

a) Derive Bessel's interpolation formula.

b) Explain the method to derive the general quadrature formula for equidistant ordinates.

(B) Attempt any one **07**

a) Use Stirling's formula to find y_{35} given

$y_{20} = 512, y_{30} = 439, y_{40} = 346, y_{50} = 243$ where y_x represents the number of persons at age x years in a life table.

b) Find the minimum value of y from the table.

X	0	1	2	3	4	5
Y	0.	0.25	0	2.25	16.00	56.25

Total No. of Printed Pages:02

SUBJECT CODE NO: - YY-2533
FACULTY OF SCIENCE AND TECHNOLOGY
B.Sc. (CBCGS)(Pattern 2022) T.Y SEM VI
Examination April / May 2025
Mathematics-XX Real Analysis-II

[Time: 1.30 Hours] **[Max. Marks:40]**

N. B
Please check whether you have got the right question paper.
1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q1 Choose the correct alternative of the following: **10**

1. Which of the following statement is wrong?
   a) If σ and ϱ be matrices for the set M, then $\sigma + \varrho$ is also metric for M.
   b) If A and B are open subsets of R^1 then $(A + B)$ is an open subset of R^2
   c) If the subset A of the metric space (A, ϱ) is totally bounded then A is bounded.
   d) IF a< b, then (a, b) is not of Measure zero.

2. Let A= [0.,1] Which of the following subset of A is an open subset of A?
   a) [- ½ ,1) b) $(\frac{1}{2}, 2]$ c) $[0, \frac{1}{2})$ d) None of these

3. The Value of the integral $\int_1^3 (2x - 3)dx$ is ________.
   a) 2 b) 3 c) 4 d) 5

4. Let f and g be continuous real valued functions on the Metric space M. Let A be the set of all $X \in M$ such that $f(x) < g(x)$ then the set A is _____
   a) Closed b) Open c) neither open nor closed d) Finite

5. Let $A = \{1, 2, 3, 4, \dots \dots .10\}$, then diameter of set A is _____
   a) 1 b) 5 c) 7 d) 9

Q2 A) Attempt any one of the following:

a) i. Prove that every subset of R_d is open. **03**

ii. If G_1 and G_2 are open subsets of the metric space M, then prove that $G_1 \cap G_2$ **05**

b) Prove that the Metric space (M, ϱ) is compact if and only if every sequence of points in M has a subsequence converging to a point in M. **08**

B) Attempt any one of the following:

c) i. State Picard fixed point theorem. **02**

ii. If $T(x) = x^2, 0 \le x \le 1/3$, prove that T is contraction on $[0, 1/3]$ **05**

d) Let l' be the class of all sequences $\{S_n\}_{n=1}^{\infty}$ of real numbers such that $\sum_{n=1}^{\infty}|S_n| < \infty$ Show that, if $S = \{S_n\}_{n=1}^{\infty}$ and $t = \{t_n\}_{n=1}^{\infty}$ are in l', then $\rho(s,t) = \sum_{n=1}^{\infty}|S_n - t_n|$ defines a Metric for l' **07**

Q3 A. Attempt any one of the following.

a) Prove that, if f is Riemann integrable on [a, b] and λ is any real number then λf is Riemann integrable on [a, b] and hence show that : **08**

$$\int_a^b \lambda f = \lambda \int_a^b f.$$

b) If f is continuous on the closed bounded interval $[a, b]$ and if $F(x) = x\int_a^x f(t)dt, (a \le x \le b)$ then prove that $F'(x) = f(x)$, for all $x \in [a, b]$ **08**

B. Attempt any one of the following:

c) Prove that: **07**

$$\frac{2\pi^2}{9} \le \int_{\pi/6}^{\pi/2} \frac{2x}{\sin x}dx \le \frac{4\pi^2}{9}$$

d) Find the Fourier series for the function $f(x) = x^2$ in the interval $-\pi \le x \le \pi$ **07**

Total No. of Printed Pages:02

SUBJECT CODE NO: - YY-2534
FACULTY OF SCIENCE AND TECHNOLOGY
B. Sc. (CBCGS)(Pattern 2022) T.Y SEM VI
Examination April / May 2025
Mathematics-XXI Ordinary Differential Equations

[Time: 1:30 Hours] **[Max. Marks:40]**

Please check whether you have got the right question paper.

N. B
1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q1 Choose the correct alternative. **10**

1. The Problem $y' = f(x,y)$ with $y(x_0) = x_0$ is called _______
   a. Initial Value Problem b. Boundary Value problem
   c. Both (a) and (b) d. None of these

2. The Statement " IF P is a polynomial such that $deg\ P \geq 1$, then P has at least one root". Is known as _______
   a. Fundamental theorem of algebra
   b. Fundamental theorem of Calculus
   c. Fundamental theorem of arithmetic
   d. None of these

3. Let $y^{(n)} + a_1 y^{(n-1)} + a_2 y^{(n-2)} +$ ___ $a_n y = b(x)$. If $b(x) = 0$ for all x in I. Then the equation is called _______
   a. Non-homogeneous equation b. Homogeneous equation
   c. Non-linear equation d. None of these

4. The solution of $y' + ay = 0$ is _______
   a. $\phi(x) = -Ce^{-ax}$ b. $\phi(x) = -Ce^{ax}$
   c. $\phi(x) = Ce^{-ax}$ d. None of these

5. The functions $\phi_1(x) = \cos x, \phi_2(x) = \sin x$ are _____
   a. Linearly dependent b. Linearly independent
   c. Both (a) and (b) d. None of these

Q2. A. Attempt any one **08**

a) Consider the equation
$y' + ay = b(x)$
Where a is constant, and b is a continuous function on an interval I, if x_0 is a point in I and C is any constant. Then prove that the function ϕ defined by
$$\phi(x) = e^{-ax}\int_{x_0}^{x} e^{at}\, b(t)dt + ce^{-ax}$$
is solution of this equation and also prove that every solution has this form.

b) If r is a root of multiplicity m of a polynomial P, deg $P \geq 1$, then prove that $p(r) = p'(r) = \cdots P_{(r)}^{(m-1)} = 0$ and $P^{(m)}(r) \neq 0$.

B. Attempt any one **07**

c) Consider the differential equation $y' + 5y = 2$

i. Show that the function ϕ given by $\phi(x) = \frac{2}{5} + Ce^{-5x}$ Is solution, where C is any constant

ii. Assuming every solution has this form, find that solution satisfying $\phi(1) = 2$

iii. Find the solution Satisfying $\phi(1) = 3\phi(0)$

d) Let $a = 2 + i\,3, b = 1 - i$. If for all real $x, f(x) = ax + (bx)^3$ then Compute.

i. i. $(Ref)(x)$ ii. $(ImF)(x)$

iii. $f'(x)$ iv. $\int_0^1 f(x)dx$

Q3 A. Attempt any one **08**

a) For any real x_0, and constants α, β, Prove that there exist a solution ϕ of the initial value problem.

$$L(y) = y'' + a_1 y' + a_2 y = 0$$
$$y(x_0) = \alpha, y'(x_0) = \beta$$

On $-\infty < x < \infty$.

b) Prove that the two Solutions ϕ_1, ϕ_2 of $L(y) = y'' + a_1 y' + a_2 y = 0$ Are linearly independent on an interval I if, and only if, $W(\phi_1, \phi_2)(x) \neq 0. For\ all\ x\ in\ I.$

B. Attempt any one **07**

c) Find the solution of following initial value problem:

$$y'' - 2y' - 3y = 0,$$
$$y(0) = 0, y'(0) = 1.$$

d) Find all solutions of $y'' + 4y = \cos x$.