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SUBJECT CODE NO: - BNP-2648
FACULTY OF SCIENCE AND TECHNOLOGY
B.Sc. (NEP) (P-2024) F.Y Sem I
Examination November / December 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 Q.7.

Q1 Choose the correct alternative.**10**

1. For all $x \in R$, $\cosh^2 x - \sinh^2 x =$ -----

- a) 0 b) 1 c)
- $\cosh 2x$
- d)
- $\sinh 2x$

2. If $y = \cos(3x + 4)$, then $\frac{1}{5} =$ -----

- a) $3^5 \cos(3x + 4 + 5\frac{\pi}{2})$ b) $5 \cos(3x + 4 + 5\frac{\pi}{2})$
 c) $3^5 \sin(3x + 4 + \frac{dy}{dx})$ d) $5^3 \sin(3x + 4 + \frac{\pi}{2})$

3. $\int_0^{\frac{\pi}{2}} \sin^7 x \, dx =$ -----

- a)
- $\frac{5}{16}$
- b)
- $\frac{15}{16}$
- c)
- $\frac{16}{35}$
- d)
- $\frac{7}{8}$

4. The area bounded by a curve $y = f(x)$, the axis of x and two ordinates $x = a$ and $x = b$ is given by -----

- a)
- $\int_a^b x \, dx$
- b)
- $\int_a^b x f(x) \, dx$
- c)
- $\int_a^b y^2 \, dx$
- d)
- $\int_a^b f(x) \, dx$

5. If $z = ax^2 + 2hxy + by^2$, then $x \frac{\partial z}{\partial x} + y \frac{\partial z}{\partial y} =$ -----

- a)
- $3z$
- b)
- $2z$
- c)
- z
- d)
- $4z$

Q2 If $y = e^{ax} \cdot \sin(bx + c)$, then show that $\frac{d^n y}{dx^n} = (a^2 + b^2)^{\frac{n}{2}} e^{ax} \cdot \sin(bx + c + n \tan^{-1} \frac{b}{a})$ **05**

Q3 If in the Cauchy's mean value theorem $f(x) = \sin x$ and $F(x) = \cos x$ show that 'C' is arithmetic mean between a and b. **05**

Q4 Find the length of the arc of the catenary $y = c \cosh(\frac{x}{c})$ measured from the vertex (0, c) **05**

to any point (x, y)

Q5 Obtain a reduction formula for $\int \cos^n x \, dx$, where n is a positive integer. 05

Q6 If $y = x^2 \cdot \sin x$, prove that $\frac{d^n y}{dx^n} = (x^2 - n^2 + n) \sin\left(x + n\frac{\pi}{2}\right) - nx \cos\left(x + n\frac{\pi}{2}\right)$ 05

Q7 Find the volume of the solid generated by rotating completely about x -axis, the area enclosed between $y^2 = x^3 + 5x$ and the lines $x = 2$ and $x = 4$ 05

