26/5 (75)

322203

Sr. No 322203

May 2023

B.Sc.(Chemistry) II SEMESTER

Basic Calculus (OMTH-202)

Time: 3 Hours **Max. Marks:75**

Instructions: 1. *It is compulsory to answer all the questions (1.5 marks each) of Part -A in short.*
2. *Answer any four questions from Part -B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART -A

Q1 (a) Define limit and differentiability of a function at a point c. (1.5)

(b) Discuss the continuity of the function $f(x) = \begin{cases} 2x-1 & ; x<0 \\ 2x+1 & ; x \geq 0 \end{cases}$ (1.5)

(c) What is the value of $\int_2^3 (x^2)dx$ (1.5)

(d) Write down the procedure of finding maxima and minima of a function by first derivative test. (1.5)

(e) State second fundamental theorem of integral calculus. (1.5)

(f) Prove that the function (1.5)
$f(x) = 5x - 3$
is continuous at x = 0 and at x = 5

(g) What are direction cosines and direction ratios of a vector. (1.5)

(h) Find out the slope of the tangent to the curve $y = x^3 - 3x + 2$ at the point whose x coordinate is 3 (1.5)

(i) Define collinear vectors with suitable example. (1.5)

(j) Explain scalar triple product with example. What happen if we interchange any two vectors. (1.5)

PART -B

Q2 (a) Find out all the points of local maxima and local minima of the function $f(x) = x^3 - 3x + 3$ (8)

(b) Find out the interval in which the function (7)
$f(x) = 4x^3 - 6x^2 - 72x + 30$ is (i) increasing (ii) decreasing

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Q3 (a) Differentiate $e^{sec^2x} + 3cos^{-1}x$ (8)

(b) If $y = sin^{-1}x$ (7)

Find out the value of $(1 - x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx}$

Q4 (a) Find out $\frac{dy}{dx}$ if $y^x + x^y + x^x = a^2$ (8)

(b) Differentiate $\sin(\cos(x^2))$ with respect to x (7)

Q5 (a) Evaluate $\int_0^2 (x^2 + 1)dx$ as a limit of sum. (8)

(b) Solve $\int \frac{x^4}{(x-1)(x^2+1)} dx$ (7)

Q6 (a) Evaluate $\int (\sqrt{cotx} + \sqrt{tanx})\, dx$ (8)

(b) Find out the area enclosed by the circle $x^2 + y^2 = a^2$ (7)

Q7 (a) Find a vector in the direction of $5\hat{\imath} - \hat{\jmath} + 2\hat{k}$ which has magnitude 8 unit. (8)

(b) If $\vec{A} = 5\hat{\imath} - \hat{\jmath} - 3\hat{k}$ and $\vec{B} = \hat{\imath} + 3\hat{\jmath} - 5\hat{k}$ then show that $\vec{A} - \vec{B}$ and $\vec{A} + \vec{B}$ are perpendicular. (7)

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