

Code No. : BC-291

Online Annual Examination, 2022

B.C.A. Part II

MATHEMATICS

Paper I

(Calculus and Differential Equations)

Time : Three Hours] [Maximum Marks : 80

Note : Section 'A', containing 10 very short answer type questions, is compulsory. Section 'B' consists of short answer type questions and Section 'C' consists of long answer type questions. Section 'A' has to be solved first.

Section 'A'

Answer the following very short answer type questions in one or two sentences. 1 × 10 = 10

1. Define continuity from right.
2. Define discontinuity of the second kind.
3. Find the differential coefficient of $\sin x^2$.
4. Define local minima.

5. Write the value of $\int \frac{1}{1+x^2} dx$.

6. Write the value of $\int \frac{x^n}{4} dx$.

7. Write the value of $\int_0^{\pi/4} \tan^2 x dx$.

8. Write the value of $\int_0^1 \frac{(\tan^{-1} x)^2}{1+x^2} dx$.

9. Write the degree and order of

$$x^2 \left(\frac{d^2 y}{dx^2} \right)^3 + y^2 \left(\frac{dy}{dx} \right)^4 + y^4 = 0.$$

10. Define general solution of a differential equation.

Section 'B'

Answer the following short answer type questions with word limit 150-200. 4 × 5 = 20

1. State and prove Boundedness theorem.

Or

Find the value of $\lim_{x \rightarrow \infty} \left(1 + \frac{1}{x^2} \right)^2$.

Code No. : BC-291

2. Find the differential coefficient of $\tan^{-1} \frac{x}{\sqrt{1+x^2}}$.

Or

Differentiate x^x with respect to x .

3. Evaluate : $\int x^2 e^{-x} dx$.

Or

Evaluate : $\int \frac{1}{x^2 - x - 6} dx$.

4. Find the value of $\int_0^{\pi/3} \frac{\cos x}{3 + 4 \sin x} dx$.

Or

Evaluate : $\int_0^{\pi} \cos^6 x dx$.

5. Solve : $(1 - x^2) (1 - y) dx = xy (1 + y) dy$.

Or

Form the differential equation of $Ax^2 + By^2 = 1$.

Code No. : BC-291

Section 'C'

Answer the following long answer type questions with word limit 300-350. $10 \times 5 = 50$

1. Verify that $\lim_{x \rightarrow -1} (2x^2 + 3) = 5$.

Or

Test the continuity of $f(x) = \begin{cases} 2x+3 & \text{if } x < 1 \\ 2 & \text{if } x = 1 \\ 7-2x & \text{if } x > 1 \end{cases}$

at $x = 1$.

2. If $y = \tan^{-1} \frac{2t}{1-t^2}$ and $x = \sin^{-1} \frac{2t}{1+t^2}$, then prove that

$$\frac{dy}{dx} = 1.$$

Or

Investigate for what value of x , $5x^6 - 18x^5 + 15x^4 - 10$ is a maximum or minimum.

3. Integrate : $\int \frac{dx}{\sqrt{1 + \sin x}}$

Code No. : BC-291

Or

Integrate : $\int \log(1+x^2)dx$.

4. Integrate $\int_0^\pi \frac{x \sin x}{1+\cos^2 x} dx$.

Or

Integrate $\int_0^\pi \frac{x \tan x}{\sec x + \tan x} dx$.

5. Solve $(x+y)(dx-dy) = dx+dy$.

Or

Solve $(y-x)\frac{dy}{dx} = a\left(y^2 + \frac{dy}{dx}\right)$.

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