Roll No. ....　　Total No. of Sections : 3

Total No. of Printed Pages : 5

Annual Online Examination 2021
Code No. : A.B.C-291

B.C.A. Part II

BCA–201

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. Write the statement of Borel's theorem.

2. Define parametric functions.

3. Define limit of a function.

4. Write the statement of Boundedness theorem.

5. Write any two applications of derivatives.

6. Write any two examples of Indefinite integral.

7. Define the idea behind integration by substitution.

8. Find the value of $\int_0^5 \sqrt{x}$.

9. Write the order and degree of the following differential equation :

$$\frac{d^4 y}{dt^4} + \frac{dy}{dt} + y = 1.$$

10. Give an example of separable differential equation.

Section 'B'

Answer the following Short Answer Type Questions in about 150-200 words :　　**4×5=20**

1. Describe different types of discontinuity of a function.

Or

State and prove intermediate value theorem.

2. If $y = \dfrac{ax + b}{cx + d}$, then show that $2y_1 y_3 = 3y_2{}^2$.

Or

If $x = 2at^2$ and $y = 4at$, then find $\dfrac{d^2 y}{dx^2}$.

[2]

3. Solve : $\int \dfrac{dx}{1 + 2 \tan x}$.

Or

Solve : $\int \dfrac{dx}{\sqrt{a^2 - x^2}}$.

4. Evaluate : $\int_0^{\pi/2} \dfrac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}}\, dx$.

Or

Find the value of the following :

$$\int_0^{\pi/2} \dfrac{dx}{4 + 5 \sin x}$$.

5. Solve : $\dfrac{dy}{dx} = \dfrac{1 + y^2}{1 + x^2}$.

Or

Form the differential equation from $y = Ae^{2x} + Be^x + C$ where A, B, C are constant.

Section 'C'

Answer the following Long Answer Type Questions in about 300-350 words :   **10×5=50**

---

1. Test the following function for continuity at the origin :

$$f(x) = \begin{cases} \dfrac{xe^{1/x}}{1 + e^{1/x}}, & \text{if } x \neq 0 \\ 0, & \text{if } x = 0. \end{cases}$$

Or

Show that the function $f(x)$ defined by

$$f(x) = \begin{cases} x^2 - 1, & \text{when } x \geq 1 \\ 1 - x, & \text{when } x < 1 \end{cases}$$

is not differentiable at $x = 1$.

2. Differentiate $y = x^{e^x}$.

Or

Examine the following function for maxima and minima :

$$y = (x - 1)^3 (x - 2)^2.$$

3. Find the value of $\int \dfrac{(x^3 + x^2 + 2)\, dx}{(x^2 + 2)^2}$.

Or

Find the value of $\int \sin^6 x\, dx$.

4. Find the value of $\int_0^{\pi/2} \dfrac{x}{\sin x + \cos x}\, dx$.

Or

Prove that : $\int_0^\infty \dfrac{dx}{a^2 + b^2 x^2} = \dfrac{\pi}{2ab}$.

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

Or

Find the equation of the curve through the point $(1, 0)$ which statisfies the differential equation

$$(1 + y^2)\, dx - xy dy = 0.$$

❏ ❏ ❏ ❏ ❏ d ❏ ❏ ❏ ❏ ❏

[5]