



LJ-1242

BCA (Part-II)

Term End Examination, 2021

Paper - I

Calculus and Differential Equations

Time : Three Hours] [*Maximum Marks* : 80

[*Minimum Pass Marks* : 27

Note : Answer any **two** parts from each question. All questions carry equal marks.

Unit-I

1. (a) Show that the $\lim_{x \rightarrow 0} f(x)$ does not exist,

$$\text{where } f(x) = \begin{cases} \frac{|x|}{x}, & x \neq 0 \\ 0 & x = 0 \end{cases}$$

(2)

(b) Test the following function for continuity at $x = 0$:

$$f(x) = \begin{cases} x \sin \frac{1}{x}, & \text{when } x \neq 0 \\ 0, & \text{when } x = 0 \end{cases}$$

(c) State and prove Borel's theorem.

Unit-II

2. (a) If $y = \tan^{-1} \frac{a+x}{1-ax}$, then find $\frac{dy}{dx}$.

(b) If $y = (\sin x)^x + x^{\sin x}$, then find $\frac{dy}{dx}$.

(c) If $x = at^2$, $y = 2at$, then find $\frac{dy}{dx}$.

Unit-III

3. (a) Evaluate $\int \frac{dx}{1-\sin x}$.

(b) Evaluate $\int \frac{a}{b+ce^x} dx$.

(c) Evaluate $\int \sec^3 x dx$.

(3)

Unit-IV

4. (a) Prove that :

$$\int_0^{2a} f(x) dx = \begin{cases} 2\int_0^a f(x) dx, & \text{if } f(2a-x) = f(x) \\ 0 & \text{if } f(2a-x) = -f(x) \end{cases}$$

(b) Show that :

$$\int_0^{\pi/2} \frac{\sin x}{\sin x + \cos x} dx = \frac{\pi}{4}$$

(c) Evaluate :

$$\int_0^{\pi/2} \sin 2x \log \tan x dx$$

Unit-V

5. (a) Find the differential equation by the family of curves $y = c_1 \cos ax + c_2 \sin ax$, where c_1 and c_2 are arbitrary constant. And also find the degree and order of differential equation.

(b) Solve the differential equation :

$$\frac{dy}{dx} = e^{x-y} + x^2 e^{-y}$$

(c) Solve $(D^2 + D + 1)y = \sin 2x$.