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| PROGRAMME | BACHELOR OF COMPUTER APPLICATIONS (BCA) |
| SEMESTER | I |
| COURSE CODE & NAME | FUNDAMENTAL OF MATHEMATICS (DCA1105) |

Section A

Multiple Choice Questions (2 Marks each)

[Please answer *all* the questions]

1. Which of the following is an example of a one-to-one function?

- a) $y = x^2$
- b) $y = x + 3$
- c) $y = x^3$
- d) $y = |x|$

2. If $f(x) = \sqrt{x}$ and $g(x) = x + 4$, what is $(f \circ g)(x)$?

- a) $\sqrt{x} + 4$
- b) $\sqrt{x + 4}$
- c) $\sqrt{x} - 4$
- d) $x^2 + 4$

3. What is the derivative of $1/x$?

- a) $-1/x^2$
- b) $1/x$
- c) $-x^2$
- d) $-1/x$

4. What is the derivative of $\ln(\sin(x))$?

- a) $\cot(x)$
- b) $\cos(x)/\sin(x)$
- c) $1/\sin(x)$
- d) $-\cos(x)$

5. What is the value of $\sin(90^\circ)$?

- a) 0

- b) -1
- c) 1
- d) $1/2$

6. If $\ln(e^3) = x$, what is the value of x ?

- a) 3
- b) 1
- c) 2
- d) 0

7. Which of the following represents the product rule?

- a) $u'v + uv'$
- b) uv'
- c) $uv' + vu'$
- d) None

8. If $f'(x) > 0$ in an interval, what can be said about the function in that interval?

- a) $f(x)$ is increasing
- b) $f(x)$ is decreasing
- c) $f(x)$ is constant
- d) None

9. At what point does the function $f(x) = x^3$ have an inflection point?

- a) $X=1$
- b) $X=0$
- c) $X=-1$
- d) $X=2$

10. In integration by parts, which function is usually chosen as u ?

- a) The one that simplifies on differentiation
- b) The one that simplifies on integration
- c) The one with the highest degree
- d) The one with the lowest degree

Section-B

SHORT ANSWERS (5 Marks each)

Approximately (200-250) words

[Please answer Any Four questions]

- Find the domain and range of the following function:
(i) $f(x)=x^2$ (ii) $g(x)=\sqrt{x}$
- Let $f : \{2, 3, 4, 5\} \rightarrow \{3, 4, 5, 9\}$ and $g : \{3, 4, 5, 9\} \rightarrow \{7, 11, 15\}$ be functions defined as $f(2) = 3, f(3) = 4, f(4) = 5, f(5) = 9$ and $g(3) = 7, g(4) = 11, g(5) = 15$. Find $g \circ f$.
- Find the derivative of $f(x) = x^2 + 2x$ using the first principle.
- Decompose : $\frac{3x^2+5x+2}{x^2+4}$.
- Find the definite integral of $f(x)=2x$ from $x=1$ to $x=3$.
- Evaluate: $\int x \log x \, dx$.

Section C

LONG ANSWERS (10 Marks each)

Approximately (400-500) words

[Please answer Any Three questions]

- Evaluate the followings:
(i) $\lim_{n \rightarrow \infty} \frac{2+n+n^2}{2+3n+4n^2}$ (ii) $\lim_{x \rightarrow 2} \frac{2x^2-3x-2}{x-2}$.
- Find the derivative of
(i) $y = \sec(\tan \sqrt{x})$ (ii) $y = \sqrt{\cot(x^2)}$.
- Find the local maxima and minima of the function $f(x)=x^3-6x^2+9x+1$ using the first and second derivative tests.
- Find the area under the upper semicircle of the circle $x^2 + y^2 = 4$ from $x = -2$ to $x = 2$.