D 93935

Name...

Reg. No...................................

FIRST SEMESTER (CBCSS—UG) DEGREE EXAMINATION, NOVEMBER 2020

Instrumentation

INS 1B 01—APPLIED MATHEMATICS

Time : Two Hours and a Half   Maximum : 80 Marks

Section A (Short Answer Type Questions)

Answer at least **ten** *questions.*
Each question carries 3 marks.
All questions can be attended.
Overall Ceiling 30.

1. Find $\lim\limits_{x \to 0} \dfrac{e^{3x} - 1}{x}$.

2. Find $\int (3x + 5)^4 \, dx$.

3. Evaluate $\int_0^a \dfrac{x^2}{\sqrt{a^2 - x^2}} \, dx$.

4. Find $\dfrac{dy}{dx}$, if $y = \sqrt{(1 - x^3)}$.

5. Solve $\dfrac{dy}{dx} = 4x^2$ with $y(1) = 2$.

6. Write the frequency definition of probability.

7. The range of the real valued function $f(x) = \sqrt{9 - x^2}$ is ?

8. Find $\dfrac{dy}{dx}$, if $y = 2 \operatorname{cosec}^2(x)$.

9. Find the mean of 21, 23, 28, 25, 35, 42, 39.

10. Does the function $f(x) = \sin(x)$ is continuous for every values of x ?

11. Does the curve $y = x^4 - 2x^2 + 2$ have any horizontal tangent ? If so, where ?

12. Evaluate $\lim\limits_{x \to 0} \dfrac{\tan x - \sin x}{x^3}$.

Turn over

13. Find the absolute maximum and minimum values of $f(x) = \sin x + \cos x$ in $(0, \pi)$.

14. Find the slope of the curve $x^3 y^3 + y^2 = x + y$ at the point (1, 1).

15. Find $\dfrac{dy}{dx}$, if $x^2 = y^2 + y\sin(x)$.

$(10 \times 3 = 30 \text{ marks})$

Section B (Paragraph Type Questions)

*Answer at least **five** questions.*
Each question carries 6 marks.
All questions can be attended.
Overall Ceiling 30.

16. Evaluate $\displaystyle \lim_{x \to 0} \left(\dfrac{4 - \sqrt{16 + x}}{x} \right)$.

17. Verify Rolle's theorem for the function $f(x) = \cos x + \sin x$ in the interval $[0, 2\pi]$.

18. Does the graph of $f(x) = \begin{cases} 0, & x < 0 \\ 1, & x \geq 0 \end{cases}$ have a vertical tangent at the point (0, 1) ?

Give reason for your answer :

19. Find $\dfrac{dy}{dx}$, if $y = \dfrac{2x + 5}{3x - 2}$.

20. If $x = 2t + 3$ and $y = t^2 - 1$, find the value of $\dfrac{dy}{dx}$ at $t = 6$.

21. Find the probability of getting an even number with an ordinary six faced die.

22. If $f(x) = \begin{cases} \dfrac{1 - \cos 4x}{x^2}, & \text{when } x < 0 \\ a, & \text{when } x = 0 \\ \dfrac{\sqrt{x}}{\sqrt{(16 + \sqrt{x})} - 4}, & \text{when } x > 0 \end{cases}$, when $x < 0$, find the value of 'a' ,if $f(x)$ is continuous at

$x = 0$.

23   If $y = x^{\cos x}$, find $\dfrac{dy}{dx}$.

<div align="right">(5 × 6 = 30 marks)</div>

Section C

Answer any **two** *questions.*
Each question carries 10 *marks.*

24   Find for what values of x, the following expression is maximum and minimum respectively. $2x^3 - 21x^2 + 36x - 20$. Find also the maximum and minimum value.

25   Find $\displaystyle\lim_{x \to \infty} \dfrac{5x^2 + 8x - 3}{3x^2 + 2}$.

26   Find the area of the region enclosed by the parabolas $y^2 = 4x$ and $x^2 = 4y$.

27   Find the mean and standard deviation for the following data :

Size of item	:	4	5	6	7	8	9	10
Frequency		6	12	15	28	20	14	5

<div align="right">(2 × 10 = 20 marks)</div>