DAE/IIA-2020/05 SECOND YEAR

(Common with Bio Medical, Computer, Food Computer Information, Electrical, Electronics, Food Processing & Preservation, Instrument, Critical Health Care and Telecommunication Technologies.)

MATH – 233 APPLIED MATHEMATICS – II

PAPER – A (PART – B)

Time: 2:30 Hours **SECTION – I** **Marks: 60**

Q.1: Write short answer to any Eighteen (18) of the questions: - $18 \times 2 = 36$

1. If $f(x) = 2x\sqrt{1-x^2}$, then find $f(\sin\theta)$.
2. Find the value of $\lim\limits_{x\to 2} \dfrac{x^3-8}{x^2-3x+2}$.
3. Find the value of $\lim\limits_{x\to 0} \left(1+\dfrac{x}{3}\right)^{1/x}$.
4. Evaluate: $\lim\limits_{x\to \frac{\pi}{2}} \dfrac{\sec x}{\tan x}$.
5. Differentiate $\left(ax^p + bx^q\right)^{p/q}$ w.r.t. 'x'.
6. Differentiate $\dfrac{x}{x^2+1}$ w.r.t. 'x'.
7. Find $\dfrac{dy}{dx}$ If $xy + y^2 = 2$.
8. If $y = \dfrac{1}{(x-3)(x+2)}$, find $\dfrac{dy}{dx}$.
9. Differentiate $\sin\sqrt{x} + \sqrt{\sin x}$ w.r.t. 'x'.
10. Find the derivative of $x^2 \tan x$.
11. Differentiate $\sec^{-1}(\sin x)$ w.r.t. 'x'.
12. Find $\dfrac{dy}{dx}$ If $y = \cos(\ell n x)$.
13. Find $\dfrac{d}{dx}\left(e^{2x}\cos 2x\right)$
14. Is the following function even, odd or neither $f(x) = x\sqrt{x^2-1}$.
15. If $y = \ell n x$, find y_2.
16. Find the slope of tangent to the curve $y = \cos^2 x$ at $x = \dfrac{\pi}{4}$.
17. Find the critical values for 'x' of the function: $y = x^3 - 3x^2 - 24x + 10$.
18. If $y = \sqrt{\sin x + \sqrt{\sin x + \sqrt{\sin x + \ldots \infty}}}$, prove that : $(2y-1)\dfrac{dy}{dx} = \cos x$.
19. If displacement $s = \sin 2t$, find the velocity at $t = \pi/6$.
20. Define decreasing function.
21. Find the standard deviation from the values $2, 3, 5, 8, 11$.
22. If a die is rolled once, what is the probability of getting an odd number?
23. Find the median of 4, 3, 5, 2, 11.
24. Find mean of the data.

x	1	3	5	7	9
f	2	7	11	5	4

25. Define sample space and give example.
26. Find $\dfrac{dy}{dx}$ at the given point if: $y = x + 2x^{-1}$ at $x = 2$.
27. Find $\dfrac{d}{dx}\left(a^{x^2}\right)$.

SECTION – II

Note: Attempt any three (03) questions. $3 \times 8 = 24$

Q.2. **(a)** Show that $x.\dfrac{a^x+1}{a^x-1}$ is an Even function of x.

(b) Evaluate: $\lim\limits_{x\to 0} \dfrac{\tan x - \sin x}{x^3}$.

Q.3. **(a)** Find the derivative w.r.t. 'x' $\dfrac{\sqrt{x}}{\sqrt{x+1}}$

(b) Differentiate $\dfrac{x^2+a^2}{x^2-a^2}$ w.r.t. $\dfrac{x-a}{x+a}$.

Q.4 **(a)** If $xy = \cos(x+y)$, show that $\dfrac{dy}{dx} + \dfrac{y+\sin(x+y)}{x+\sin(x+y)} = 0$

(b) If $y = x\tan^{-1}\left(\dfrac{x}{y}\right)$, then prove that : $\dfrac{dy}{dx} = \dfrac{y}{x}$.

Q.5 **(a)** Find the derivative w.r.t. 'x' $(x)^{\sin x}$.

(b) Find the relative maxima and minima of function: $y = \dfrac{1}{4}x^4 - \dfrac{3}{2}x^2$.

Q.6 **(a)** Calculate Arithmetic Mean and Mode.

Class Interval	Frequency
1 – 3	12
4 – 6	5
7 – 9	20
10 – 12	22
13 – 15	14
16 – 18	17

(b) If two dice are rolled. What is the probability that:

(i) A sum greater then 9 appears.

(ii) A sum divisible by 5 appears.

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