DAE/IIA-2019/05 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' (Subjective)

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 $f(x) = \ell n(x)$, then prove that: $f(pq) = f(p) + f(q)$.
2. If $f(x) = \ell n(x)$, then prove that: $f\left(\frac{p}{q}\right) = f(p) - f(q)$.
3. If $f(x) = \sin x + \cos x$, show that: $f(x + \pi) = -f(x)$.
4. Show that the function $f(x) = x^4 - 7x^2 + 7$ is an even function of x.
5. Find the derivative of $(a + x)\sqrt{a - x}$ w.r.t. 'x'.
6. If $y = \frac{1}{(x-3)(x+2)}$, find $\frac{dy}{dx}$.
7. Differentiate $\frac{x}{x^2+1}$ w.r.t. 'x'.
8. If $y = \frac{1+x}{1-x}$, find $\frac{dy}{dx}$.
9. If $y = \frac{x^2+1}{x-1}$, find $\frac{dy}{dx}$ at $x = 2$.
10. If $y = u^n$ & $u = (3x^3 - 7x^2 + x + 1)$ find $\frac{dy}{dx}$.
11. Find the derivative of $x^2 \sec 4x$.
12. Differentiate $\sin^{-1}\sqrt{x}$ w.r.t. 'x'.
13. Differentiate $\sin^{-1}\left(\frac{x}{3}\right)$ w.r.t. 'x'.
14. Differentiate $x^2 \cot^{-1} x$ w.r.t. 'x'.
15. Differentiate $\ell n\sqrt{x}$ w.r.t. 'x'.
16. Differentiate $\sin(\ell n \tan x)$.
17. Differentiate $x \ell n 3x$ w.r.t. 'x'.
18. Find slope of tangent to $x = a\cos\theta$, $y = b\sin\theta$ at $\theta = \frac{\pi}{4}$.
19. Find the slope of tangent to the curve $y = x^3 - 3x + 2$ at $(0, 2)$.
20. For the curve $x = t^2 - 1$, $y = t^2 - t$, the tangent is parallel to x-axis, find the value of t.
21. If $x = a\cos\theta$, $y = a\sin\theta$, find $\frac{d^2y}{dx^2}$.
22. If mode = 15, Median = 12 find mean.
23. Define arithmetic mean.
24. The arithmetic mean of 7 values is 6 find the sum of values.
25. If two coins are tossed find the probability that only one head.
26. Tickets numbered 1 to 20 are mixed up and then a ticket is drawn at random. What is the probability that ticket drawn has a number multiple of 3 or 5.
27. If a die is rolled once, what is the probability of getting a 4.

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: $\lim\limits_{\theta \to 0} \dfrac{1-\cos p\theta}{1-\cos q\theta}$.

Q.3. (a) Differentiate $x^{2/3}$ by ab-initio method (or first principle).

(b) Differentiate $x\sqrt{\dfrac{a+x}{a-x}}$ w.r.t. 'x'.

Q.4 (a) If $\sin y = x\sin(a+y)$, prove that : $\dfrac{dy}{dx} = \dfrac{\sin^2(a+y)}{\sin a}$

(b) Find the derivative of $\ell n\left(\dfrac{x^2+x+1}{x^2-x+1}\right)$.

Q.5. (a) Use differentials to find the approximate value of $\sqrt{65}$.

(b) Find the maximum and minimum (extreme) values of the function $\dfrac{x^3}{3} - \dfrac{3x^2}{2} + 2x + 5$.

Q.6. (a) Find the mean for the following distribution showing marks obtained by 50 students in English.

Marks	Frequency
20 – 24	1
25 – 29	4
30 – 34	8
35 – 39	11
40 – 44	15
45 – 49	9
50 – 54	2

(b) Calculate the S.D. from the Mean for the following data, 2, 6, 9, 12, 8, 13, 5, 6, 23, 16.

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