EXERCISE – II

MULTIPLE CORRECT (OBJECTIVE QUESTIONS)

1. If $f(x) = \dfrac{x^2-1}{x^2+1}$, for every real number, then minimum value of f(x)
(A) does not exist
(B) is not attained even though f is bounded
(C) is equal to 1 (D) is equal to –1

2. Let $f(x) = 40/(3x^4 + 8x^3 - 18x^2 + 60)$, consider the following statement about f(x).
(A) f(x) has local minima at x = 0
(B) f(x) has local maxima at x = 0
(C) absolute maximum value of f(x) is not defined
(D) f(x) is local maxima at x = –3, x = 1

3. If $f(x) = a\,\ell n\,|x| + bx^2 + x$ has its extremum values at x = –1 and x = 2, then
(A) a = 2, b = –1 (B) a = 2, b = –1/2
(C) a = – 2, b = 1/2 (D) None of these

4. Let $f(x) = (x^2 - 1)^n (x^2 + x + 1)$ then f(x) has local extremum at x = 1 when
(A) n = 2 (B) n = 3 (C) n = 4 (D) n = 6

5. An extremum value of the function
$f(x) = (\arcsin x)^3 + (\arccos x)^3$ is
(A) $\dfrac{7\pi^3}{8}$ (B) $\dfrac{\pi^3}{8}$ (C) $\dfrac{\pi^3}{32}$ (D) $\dfrac{\pi^3}{16}$

6. If $f(x) = \dfrac{x}{1+x\tan x}$, $x \in \left(0, \dfrac{\pi}{2}\right)$, then
(A) f(x) has exactly one point of minima
(B) f(x) has exactly one point of maxima
(C) f(x) is increasing in $\left(0, \dfrac{\pi}{2}\right)$
(D) maxima occurs at x_0 where $x_0 = \cos x_0$

7. If $f(x) = \begin{cases} -\sqrt{1-x^2} & , \quad 0 \le x \le 1 \\ -x & , \quad x > 1 \end{cases}$, then
(A) Maximum of f(x) exist at x = 1
(B) Maximum of f(x) doesn't exists
(C) Minimum of $f^{-1}(x)$ exist at x = –1
(D) Minimum of $f^{-1}(x)$ exist at x = 1

8. If the function y = f(x) is represented as,
$x = \phi(t) = t^3 - 5t^2 - 20t + 7$
$y = \psi(t) = 4t^3 + 4t^2 - 18t + 3$ ($|t| < 2$), then
(A) $y_{max} = 12$ (B) $y_{max} = 14$
(C) $y_{min} = -67/4$ (D) $y_{min} = -69/4$

9. For the function $f(x) = x^{2/3}$, which of the following statement(s) is/are true ?
(A) $\dfrac{dy}{dx}$ at the origin is non existent
(B) equation of the tangent at the origin is x = 0
(C) f(x) has an extremum at x = 0
(D) origin is the point of inflection

10. If $\lim\limits_{x\to a} f(x) = \lim\limits_{x\to a} [f(x)]$ and f(x) is non–constant continuous function, then
(where [$*$] denotes the greatest integer function)
(A) $\lim\limits_{x\to a} f(x)$ is integer (B) $\lim\limits_{x\to a} f(x)$ is non–integer
(C) f(x) has local maximum at x = a
(D) f(x) has local minima at x = a

11. Let $f(x) = \begin{cases} x^3 + x^2 - 10x & -1 \le x < 0 \\ \sin x & 0 \le x < \pi/2 \\ 1 + \cos x & \pi/2 \le x \le \pi \end{cases}$ then f(x) has
(A) local maximum at $x = \pi/2$
(B) local minima at $x = \pi/2$
(C) absolute minima at $x = 0, \pi$
(D) absolute maxima at $x = \pi/2$

12. The sum of the legs of a triangle is 9 cm. When the triangle rotates about one of the legs, a cone results which has the maximum volume. Then
(A) slant height of such a cone is $3\sqrt{5}$
(B) maximum volume of the cone is 32π
(C) curved surface of the cone is $18\sqrt{5}\,\pi$
(D) semi vertical angle of cone is $\tan^{-1}\sqrt{2}$

13. The function $f(x) = \sin x - x \cos x$ is
(A) maximum or minimum for all integral multiple of π
(B) maximum if x is an odd positive or even negative integral multiple of π
(C) minimum if x is an even positive or odd negative integral multiple of π
(D) None of these

14. The curve $y = \frac{x+1}{x^2+1}$ has
(A) x = 1, the point of inflection
(B) $x = -2 + \sqrt{3}$, the point of inflection
(C) x = –1, the point of minimum
(D) $x = -2 - \sqrt{3}$, the point of inflection

15. If the derivative of an odd cubic polynomial vanishes at two different values of 'x' then
(A) coefficient of x^3 & x in the polynomial must be same in sign
(B) coefficient of x^3 & x in the polynomial must be different in sign
(C) the values of 'x' where derivative vanishes are closer to origin as compared to the respective roots on either side of origin
(D) the values of 'x' where derivative vanishes are far from origin as compared to the respective roots on either side of origin

16. Let $f(x) = ln(2x - x^2) + \sin \frac{\pi x}{2}$. Then
(A) graph of f is symmetrical about the line x = 1
(B) graph of f is symmetrical about the line x = 2
(C) maximum value of f is 1
(D) minimum value of f does not exist

17. The maximum and minimum values of
$y = \frac{ax^2+2bx+c}{Ax^2+2Bx+C}$ are those for which
(A) $ax^2 + 2bx + c - y(Ax^2 + 2Bx + C)$ is equal to zero
(B) $ax^2+2bx+c-y(Ax^2+2Bx+C)$ is perfect square
(C) $\frac{dy}{dx} = 0$ and $\frac{d^2y}{dx^2} \neq 0$
(D) $ax^2 + 2bx + c - y(Ax^2 + 2Bx + C)$ is not a perfect square

18. Maximum and minimum values of the function,
$f(x) = \frac{2-x}{\pi} \cos(\pi(x+3)) + \frac{1}{x^2} \sin(\pi(x+3))$ $0<x<4$ occur at
(A) x = 1 (B) x = 2 (C) x = 3 (D) $x = \pi$

19. If $f(x) = \log(x-2) - \frac{1}{x}$, then
(A) f(x) is M.I. for $x \in (2, \infty)$
(B) f(x) is M.I. for $x \in [-1, 2]$
(C) f(x) is always concave downwards
(D) $f^{-1}(x)$ is M.I. wherever defined