

VNR12M

Virudhunagar District Common Examinations
Common Second Mid Term Test - November 2022

Standard 12

MATHEMATICS

Time: 1.30 Hrs.

Marks: 50

I. Choose the correct answer from the given four alternatives: $10 \times 1 = 10$

- 1) The position of a particle moving along the horizontal line of any time t is given by $s(t) = 3t^2 - 2t - 8$, the time at which the particle is at rest is,
 1) $t = 0$ 2) $t = \frac{1}{3}$ 3) $t = 1$ 4) $t = 3$
- 2) Limit $\lim_{x \rightarrow 0} \left(\cot x - \frac{1}{x} \right)$ is
 1) 0 2) 1 3) 2 4) ∞
- 3) The minimum value of the function $|3-x|+9$ is
 1) 0 2) 3 3) 6 4) 9
- 4) The point of inflection of the curve $y = (x-1)^3$ is
 1) (0, 0) 2) (0, 1) 3) (1, 0) 4) (1, 1)
- 5) If $f(x) = \frac{x}{x+1}$, then the differential is given by
 1) $\frac{-1}{(x+1)^2} dx$ 2) $\frac{1}{(x+1)^2} dx$ 3) $\frac{1}{x+1} dx$ 4) $\frac{-1}{x+1} dx$
- 6) If $u(x, y) = e^{x^2+y^2}$ then $\frac{\partial u}{\partial x}$ is equal to
 1) $e^{x^2+y^2}$ 2) $2xu$ 3) x^2u 4) y^2u
- 7) $f(x, y, z) = xy+yz+zx$ then $f_x - f_z$ is equal to
 1) $z-x$ 2) $y-z$ 3) $x-z$ 4) $y-x$
- 8) $\int_{-\pi/2}^{\pi/2} \sin^2 x \cos x dx =$
 1) $\frac{3}{2}$ 2) $\frac{1}{2}$ 3) 0 4) $\frac{2}{3}$
- 9) If $\frac{(n+2)}{(n)} = 90$ then n is
 1) 10 2) 8 3) 5 4) 9
- 10) $\int_0^a \sqrt{a^2 - x^2} dx$
 1) $\frac{\pi a^3}{16}$ 2) $\frac{3}{16} \pi a^4$ 3) $\frac{3\pi a^2}{8}$ 4) $\frac{3\pi a^4}{8}$

II. Answer any FOUR questions only:

 $4 \times 2 = 8$

- 11) Compute the value of 'c' satisfied by the Rolle's theorem for $f(x) = x^2(1-x^2)$; $x \in [0, 1]$
- 12) Find the absolute, extrema of the function $f(x) = x^2 - 12x + 10$; $[1, 2]$
- 13) Find df for $g(x) = x^2 + 3x$ and evaluate it for $x = 2$ and $dx = 0.1$
- 14) If $V(X, Y, Z) = xy + yz + zx$, $x, y, z \in R$ find dv .

VNR12M

2

15) Evaluate: $\int_0^3 (3x^2 - 4x + 5) dx$

16) Evaluate: $\int_0^{\infty} x^5 e^{-3x} dx$

III. Answer any FOUR questions only:**4×3=12**17) Find the equation of the tangent and normal to the curve $y = x^2 + 3x - 2$ at the point (1, 2).

18) Evaluate: $\lim_{x \rightarrow \frac{\pi}{2}} \frac{\sec x}{\tan x}$

19) Use the linear approximation to find the approximate values of $\sqrt[3]{26}$.20) In a newly developed city, it is estimated that the voting population (in thousands) will increase according to $V(t) = 30 + 12t^2 - t^3$, $0 \leq t \leq 8$ where t is the time in years. Find the approximate change in voters for the time change from 4 to $4\frac{1}{6}$ year.

21) Evaluate: $\int_0^{\pi/4} \sin^6 2x dx$

22) Find the area of the region bounded between the parabola $y^2 = 4x$ and $x^2 = 4y$.**IV. Answer any FOUR questions only:****4×5=20**

23) A conical water tank with vertex down of 12 meters height has a radius of 5 meters at the top. If water flows into the tank at a rate of top. If water flows into the tank at a rate of 10 cubic m/min. How fast is the depth of the water increases when the water is 8 meters deep?

24) For a function $f(x) = 4x^3 + 3x^2 - 6x + 1$, find the intervals of monotonicity, local extrema and points of inflection.25) Sketch the curve $y = f(x) = x^3 - 6x - 9$.

26) If $U = \sin^{-1} \left[\frac{x+y}{\sqrt{x} + \sqrt{y}} \right]$, show that $x \frac{\partial U}{\partial x} + y \frac{\partial U}{\partial y} = \frac{1}{2} \tan U$.

27) Evaluate: $\int_2^3 \frac{\sqrt{x}}{\sqrt{5-x} + \sqrt{x}} dx$

28) Find the volume of a right circular cone of base radius r and height h .