Ts12M

Tenkasi District

Common Second Mid Term Test - 2024

29-11-24

Standard 12

MATHEMATICS

PART - I

Time: 1.30 Hours Marks: 45

I. Choose the correct answer. **10×1=10**

1) A stone is thrown up vartically. The height it reaches at time t seconds is given by $x = 80t - 16t^2$. The stone reaches the maximum height in time t seconds is given by
a) 2 b) 2.5 c) 3 d) 3.5

2) The point of inflection of the curve $y=(x-1)^3$ is
a) (0, 0) b) (0, 1) c) (1, 0) d) (1, 1)

3) The value of the limit $\lim_{x\to 0}\left(\cot x - \frac{1}{x}\right)$ is
a) 0 b) 1 c) 2 d) ∞

4) The approximate change in the volume V of a cube of side x meters caused by increasing the side by 1% is
a) 0.3x dx m^3 b) 0.03xm^3 c) 0.03x^2m^3 d) 10.03x^3m^3

5) If $u(x, y) = e^{x^2+y^2}$, then $\frac{\partial u}{\partial x}$ is equal to
a) $e^{x^2+y^2}$ b) 2xu c) x^2u d) y^2u

6) If $f(x, y, z) = xy + yz + zx$, then $f_x - f_z$ is equal to
a) z − x b) y − z c) x − z d) y − x

7) The area between $y^2 = 4x$ and its latus rectum is
a) $\frac{2}{3}$ b) $\frac{4}{3}$ c) $\frac{8}{3}$ d) $\frac{5}{3}$

8) The value of $\int_0^{\pi/6} \cos^3 3x\,dx$ is
a) $\frac{2}{3}$ b) $\frac{2}{9}$ c) $\frac{1}{9}$ d) $\frac{1}{3}$

9) The value of $\int_0^a \left(\sqrt{a^2 - x^2}\right)^3 dx$ is
a) $\frac{\pi a^3}{16}$ b) $\frac{3\pi a^4}{16}$ c) $\frac{3\pi a^2}{8}$ d) $\frac{3\pi a^4}{8}$

10) Angle between $y^2 = x$ and $x^2 = y$ at the origin is
a) $\tan^{-1}\frac{3}{4}$ b) $\tan^{-1}\frac{4}{3}$ c) $\frac{\pi}{2}$ d) $\frac{\pi}{4}$

PART - II

II. Answer any four questions. Q.No. 15 is compulsory. **4×2=8**

11) f(x) tan x, $x \in (0, \pi)$ Explain why Rolle's theorem is not applicable to the function.

12) Evaluate $\lim_{x\to\infty} \frac{2x^2 + 3}{x^2 - 5x + 3}$

13) Evaluate $\int_0^3 \frac{\sqrt{x}}{\sqrt{3-x} + \sqrt{x}} dx$

14) Find df for $f(x) = x^2 + 3x$, x = 3 and dx = 0.02

15) Let $V(x, y, z) = xy + yz + zx$, x, y, z ∈ R. Find the differential dv

PART - III

III. Answer any four questions. Q.No. 20 is compulsory. **4×3=12**

16) Show that the percentage error in the n^{th} root of a number is approximately $\frac{1}{n}$ times the percentage error in the number.

17) If $u(x, y) = \frac{x^2 + y^2}{\sqrt{x + y}}$, prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \frac{3}{2}u$

18) Find two positive numbers whose product is 20 and their sum is minimum

19) Find the intervals of monotonicity and hence find the local extrema for the function $f(x)=x^2-4x+4$

20) Find the volume of the solide formed by revolving the region bounded by the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, a> b about y axis

PART - IV

IV. Answer all the questions. **3×5=15**

21) a) Salt is poured from a conveyer belt at a rate of 30 cubic metre per minute forming a conical pile with a circular base whose height and diameter of base are always equal. How fast is the height of the pile increasing when the pile is 10 metre high?

(OR)

b) Evaluate $\int_{-\pi}^{\pi} \frac{\cos^2 x}{1 + a^x} dx$

SIVAKUMAR M
Sri Ram Matric Hss
Vallam-627 803
Tenkasi District.

22) a) The Curve $y = (x - 2)^2 + 1$ has a minimum point at P. A point on the curve is such that the slope of PQ is 2. Find the area bounded by the curve and the Chord PQ.

(OR)

If $u = \sin^{-1}\left(\frac{x + y}{\sqrt{x} + \sqrt{y}}\right)$, show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \frac{1}{2}\tan u$

23) a) Find the dimensions of rectangle with maximum area that can be inscribed in a circle of radius 10 cm.

(OR)

b) $W(x, y, z) = xy + yz + zx$, $x = u - v$, $y = uv$, $z = u + v$, $u, v \in R$. Find $\frac{\partial w}{\partial u}$, $\frac{\partial w}{\partial v}$ and evaluate them at $\left(\frac{1}{2}, 1\right)$

- - - - - -