Model Question Paper

Differential Calculus Part I - Part III

12th Standard

	Maths Reg.No.:
I	Answer all questions.
I	I.Use blue pen only.
Tim	ne : 01:00:00 Hrs Total Marks : 85
	Section-A 3x1=3
1)	If the volume of an expanding cube is increasing at the rate of 4cm ³ / sec then the rate of change of surface area when the volume of the cube is 8 cubic cm is
	(a) $8 \text{ cm}^2/sec$ (b) $16 \text{ cm}^2/sec$ (c) $2 \text{ cm}^2/sec$ (d) $4 \text{ cm}^2/sec$
2)	The gradient of the tangent to the curve $y = 8 + 4x - 2x^2$ at the point where the curve cuts the y-axis is
	(a) 8 (b) 4 (c) 0 (d) -4
3)	The Angle between the parabolas $y^2 = x$ and $x^2 = y$ at the origin is
	(a) $2 an^{-1}\left(rac{3}{4} ight)$ (b) $ an^{-1}\left(rac{4}{3} ight)$ (c) $\pi/2$ (d) $\pi/4$
	Section-B 4 x 3 = 12
4)	Find the critical numbers and stationary points of each of the following functions. $\;f\left(x ight)=2x-3x^{2}$
5)	Determine the domain of concavity (convexity) of the curve $y=2-x^2.$
6)	Determine the domain of convexity of the function $y = e^x$
7)	Test the curve $y=x^4$ for points of inflection.
	Section-C 5 x 6 = 30
8)	Verify Lagrange's law of mean for the following functions : $f(x) = 1 - x^2$, [0, 3]
9)	If $f(1) = 10$ and $f'(x) \ge 2$ for $1 \le x \le 4$ how small can $f(4)$ possibly be ?
10)	At 2.00 p.m. a car's speedometer reads 30 miles / hr., at 2.10 pm it reads 50 miles / hr. Show that sometime between 2.00 and 2.10 the acceleration is exactly 120 miles / hr ² .
11)	Obtain the Maclaurin's Series for $\log_e (1+x) arc$ $\tan x$ or $\tan^{-1}x$
12)	Obtain the Maclaurin's Series expansion for : $\tan x$, $-\frac{\pi}{2}$ < x < $\frac{\pi}{2}$
	Section-D 4 x 10 = 40
13)	Find a point on the parabola $y^2 = 2x$ that is closest to the point (1,4)
14)	Find the area of the largest rectangle that can be inscribed in a semi circle of radius r.
15)	a) The top and bottom margins of a poster are each 6 cms and the side margins are each 4 cms. If the area of the printed material on the poster is fixed at 384 cms ² , find
	the dimension of the poster with the smallest area.
	(OR)
	b) Show that the volume of the largest right circular cone that can be inscribed in a sphere of radius a is $\frac{8}{27}$ (volume of the sphere).
