Model Question Paper

Differential Calculus Part I - Part IV

12th Standard

Maths

Reg.No. :

I.Answer all questions.

II.Use blue pen only.

Time : 01:00:00 Hrs

Total Marks : 85

Section-A

3 x 1 = 3

1) The parametric equations of the curve $x^{\frac{2}{3}}+y^{\frac{2}{3}}=a^{\frac{2}{3}}$ are

(a) x= a $sin^3\theta$; y= a $cos^3\theta$ (b) x= a $cos^3\theta$; y= a $sin^3\theta$ (c) x=$a^3 sin\theta$; y=$a^3 cos\theta$ (d) x=$a^3 cos\theta$; y=$a^3 sin\theta$

2) Let " h " be the height of the tank. Then the rate of change of pressure " p " of the tank with respect to height is

(a) $\frac{dh}{dt}$ (b) $\frac{dp}{dt}$ (c) $\frac{dh}{dp}$ (d) $\frac{dp}{dh}$

3) If the temperature $\theta^o C$ of the certain metal rod of "l" meters is given by $l=1+0.00005 \quad \theta \quad + \quad 0.0000004 \quad \theta^2$ then the rate of change of l in m / C ° when the temperature is 100°C is

(a) $0.00013 \quad m/C^\circ$ (b) $0.00023 \quad m/C^\circ$ (c) $0.00026 \quad m/C^\circ$ (d) $0.00033 \quad m/C^\circ$

Section-B

9 x 6 = 54

4) A Particle of unit mass moves so that displacement after t secs is given by $x=3cos(2t-4)$.Find the acceleration and kinetic energy at the end of 2 secs. $\left[K.E.=\frac{1}{2}mv^2, m \quad is \quad mass\right]$

5) Newton's law of cooling is given by $\theta=\theta_0^\circ \quad e^{-kt}$, where the excess of temperature at zero time is $\theta_0^o C$ and time t seconds is $\theta^O C$.Determine the rate of change of temperature after 40s, given that $\theta_0=16^\circ C$and at time k=-0.03. $\left(e^{1.2}=3.3201\right)$

6) Two sides of a triangle are 4m and 5m in length and the angle between them is increasing at a rate of 0.06 rad / sec. Find the rate at which the area of the triangle is increasing when the angle between the sides of fixed length is $\pi/3$.

7) Show that $x^2-y^2=a^2$ and $xy=c^2$ cut orthogonally.

8) Find the equation of the tangent and normal to the curves $y=x^2-4x-5$ at x= - 2

9) Find the absolute maximum and absolute minimum values of f on the given interval: $f(x)=x-2\cos x, \qquad [-\pi,\pi]$

10) Prove the following inequalities : $\sin x>x-\frac{x^3}{6}, \quad x>0$

11) Prove the following inequalities : $tan^{-1}x<x \; for \; all \; x>0$

12) Prove the following inequalities : $log(1+x)<x \; for \; all \; x>0$

Section-C

4 x 10 = 40

13) A missile fired from ground level rises x metres vertically upwards in t seconds and $x=100t-\frac{25}{2}t^2$. Find (i) the initial velocity of the missile, (ii) the time when the height of the missile is a maximum (iii) the maximum height reached and (iv) the velocity with which the missile strikes the ground.

14) The distance x metres traveled by a vehicle in time t seconds after the brakes are applied is given by : $x=20t-5/3t^2$.Determine (i) the speed of the vehicle (in km/hr) at the instant the brakes are applied and (ii) the distance the car traveled before it stops.

15) a) The altitude of a triangle is increasing at a rate of 1 cm / min while the area of the triangle is increasing at a rate of 2 cm^2 / min. At what rate is the base of the triangle changing when the altitude is 10 cm and the area is 100 cm^2.

(OR)

b) At noon, ship A is 100 km west of ship B . Ship A is sailing east at 35 km / hr and ship B is sailing north at 25 km hr. How fast is the distance between the ships changing at 4.00 p.m.

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