Q.P. Code: 00005330

[Time:2.30 Hrs] **[Marks:75]**

Please check whether you have got the right question paper.

N.B: 1. All question are compulsory.
2. Figures to the right indicate full marks.

Q.1 Attempt any four of the following: 20

A Find the interval at which the function is increasing $f(x) = x^3 - 27x + 5$

B Draw the graph of $y = 4 - 3a^2 + a^3$

C Explain types of function

D If $f(x) = 4x + 4 \quad x < 2$
$= x^2 + 3x + 2 \quad x \geq 2$ at x = 2 then find f is differentiable or not ?

E Find for what value of x the curve $y = x^4 - 6x^3 + 12x^2 + 5x + 7$ is concave upwards and downwards

F Find the points of maxima and minima of a function: $f(x) = 2x^3 - 3x^2 + 6$

Q.2 Attempt any four of the following: 20

A Evaluate the following integral: $\int \frac{x^2}{\sqrt{1-x^3}}$

B Evaluate the following integral: $\int x \,.\, logx \, dx.$

C Evaluate: $\int_{-1}^{4} (5 - 2x)^8 dx$

D Use Simpson's rule with n = 6 to approximate the integral $\int_0^6 \frac{1}{1+x} dx$

E Find the area of the curve enclosed by the curve $y = x^2$ and $y = \sqrt{x}$

F Find the length of the curve x = cos 2t , y = sin 2t and $0 \leq t \leq \pi/2$

Q.3 Attempt any four of the following: 20

A Show that the function $f(x, y) = 2x^2 - 4y$ is differentiable able to points (1 , 1)

B Find all second order partial derivative of f. also verify whether $f_{xy} = f_{yx}$ given that $f(x, y) = x^3y^4 + x^2y$?

C Find an equation of plane tangent to $2x^2 + 3y^2 - z^2 - 4$ at (1 , 1 , -1)

D Find direction derivative of f (x, y) 3x + 4y, u = (2,3) , $\bar{v} = 4\bar{\imath} + 5\bar{\jmath}$

E Determine the critical points and locate any relative maxima , minima and saddle points of the function of defined by $f(x , y) = 2x^2 + 2xy + 2y^2 - 6x$

F Find $\frac{dz}{dt}$, where $z = x^2y^3 + y\cos x$ and x and y are x = log t^2 and y = sin 4t.

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Q.4 Attempt any three of the following: 15

A The equation $x^3 - 2x - 2 = 0$ has one real solution. Approximate it by Newton's Method take initial value $x_0 = 0.1$

B Divide 100 into two parts such that sum of their square is minimum

C Use Euler's method to solve initial value problem $\frac{dy}{dx} = x - y^2$, $y(0) = 1$, $0 \le t \le 1$ with step size $\Delta x = 0.25$

D Solve $\frac{dy}{dx} = \frac{x+y}{x-y}$ using separable form of differential equation.

E Find the first order differential equation of the following function:
a) $f(x , y) = 4x - 5y + 23$ b) $f(x , y) = e^{x+y}$

F Find the linearization of $f(x ,y) = x^3 + xy + y^2$ at (1 , 2)

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