

QP Code : 13714

(2 Hours)

[Total Marks : 40

- N. B. :** (1) Question No. 1 is compulsory.
 (2) Attempt any **four** questions from the **remaining**.
 (3) Use of **non-scientific calculator** is **allowed**.
 (4) **Figures to the right** indicate **marks**.

1. (a) Find the nth derivative of $Y = \cos^2 x + (2x + 3)^{-1}$ 4

OR

(a) Find the Extreme values of $f(x,y) = x^3 + y^3 - 63(x+y) - 12xy$ 4

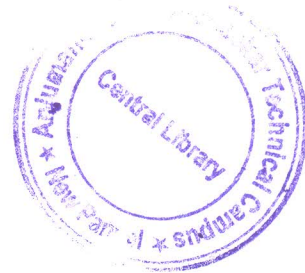
(b) Obtain the reduction formula for $\int_0^{\frac{\pi}{2}} \sin^n x \, dx$ hence evaluate $\int_0^{\frac{\pi}{2}} \sin^8 x \, dx$. 4

OR

(b) Find the volume of the solid generated by revolving about x-axis the region bounded by the curve $9x^2 - 4y^2 = 36$ in the interval $x=2$ to $x=4$. 4

2. (a) Solve the system of equations by Cramer's rule. 4
 $4x - 3y + z = 1, \quad x + 4y - 2z = 10, \quad 2x - 2y + 3z = 4$
 (b) Find the Eigen values of the Matrix A. 4

$$A = \begin{bmatrix} 4 & 2 & -2 \\ -5 & 3 & 2 \\ -2 & 4 & 1 \end{bmatrix}$$



3. (a) If $f(1)=10, f(2)=16, f(3)=26, f(4)=40$, Estimate value of $f(2.5)$ using Newton's forward difference Interpolation formula. 4

(b) If $U = \log(x^2 + y^2)$ prove that $\frac{\partial^2 U}{\partial x \partial y} = \frac{\partial^2 U}{\partial y \partial x}$ 4

4. (a) Verify Rolle's mean value Theorem for $f(x) = e^{-x}(\sin x - \cos x)$ in the interval $\left[\frac{\pi}{4}, \frac{5\pi}{4}\right]$. 4

(b) Verify Euler's Theorem for $u(x,y) = x/y + y/x$ 4

5. (a) Solve any one differential equation :- 4

(i) $(x^3 + y^3)dy = (x^2y)dx$

(ii) $\frac{dy}{dx} = \frac{x - y + 3}{2x - 2y + 5}$

- (b) Find the length of loop of the curve $4y^2 = x(x-1)^2$ 4

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6. (a) Solve any **one** differential equation :- 4

(i) $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = \sin 2x$

(ii) $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = e^{3x} + 5$

(b) If an error of 1% is found in measuring the sides of rectangle, find the resultant error in calculating the area of rectangle. 4

7. (a) Evaluate any **one** integral :- 4

(i) $I = \int_0^{\frac{\pi}{2}} \frac{\cos \theta}{\sin \theta + \cos \theta} d\theta$

(ii) $I = \int x \tan^{-1} x dx$

(b) Use Simpson's 1/3rd rule to evaluate the Integral $\int_0^6 \frac{1}{1+x} dx$ by taking $h=1$. 4

