22224

11920

3 Hours / 70 Marks Seat No. | | | | | | | | |

Instructions – (1) All Questions are *Compulsory.*

(2) Illustrate your answers with neat sketches wherever necessary.

(3) Figures to the right indicate full marks.

(4) Assume suitable data, if necessary.

(5) Use of Non-programmable Electronic Pocket Calculator is permissible.

(6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. Solve any FIVE of the following: **10**

a) State whether the function is odd or even, $f(x) = \frac{e^x + e^{-x}}{2}$

b) If $f(x) = \log_4^x + 3$, find $f\left(\frac{1}{4}\right)$

c) Find $\frac{dy}{dx}$ if $y = x^2 \cdot e^x$

d) Evaluate : $\int [e^x + a^x + x^a + a^a]\, dx$

e) Evaluate : $\int \left[\frac{1}{(1 + \cos 2x)}\right] dx$

f) Find the area bounded by $y = x$, X-axis and $x = 0$ to $x = 4$.

g) Find a real root of equation $x^3 + 4x - 9 = 0$ in the interval (1, 2) by using bisection method (only one iteration)

Marks

2. Solve any THREE of the following: **12**

a) Find $\frac{dy}{dx}$, if $y = \frac{5e^x}{3e^x + 1}$ at $x = 0$

b) If $x = a(1 + \cos\theta)$, $y = a(1 - \cos\theta)$ find dy/dx

c) A metal wire 36 cm long is bent to form a rectangle find its dimensions when its area is maximum.

d) Find radius of curvature of a curve $y = \log(\sin x)$ at $x = \pi/2$

3. Solve any THREE of the following: **12**

a) Find equation of tangent and normal to the curve $4x^2 + 9y^2 = 40$ at point (1, 2)

b) Find dy/dx if $y = \tan^{-1}\left[\frac{2x}{1 + 35x^2}\right]$

c) If $x^y = e^{(x-y)}$ Show that $\frac{dy}{dx} = \frac{\log x}{(1 + \log x)^2}$

d) Evaluate : $\int \frac{dx}{5 + 3\cos 2x}$

4. Solve any THREE of the following: **12**

a) Evaluate : $\int \frac{[e^x (x+1)]}{\cos^2 (x \cdot e^x)}\, dx$

b) Evaluate : $\int \frac{dx}{2x^2 + 3x + 2}$

c) Evaluate : $\int x^2 \cdot \tan x\, dx$

d) Evaluate : $\int \frac{\sec^2 x}{(\tan x)[\tan x + 1]}\, dx$

e) Evaluate : $\int_0^{\pi/2} \frac{1}{1 + \sqrt{\tan x}}\, dx$

Marks

5. Solve any TWO of the following: **12**

a) Find area bounded by the curve $y = x^2$ and the line $y = x$

b) Attempt the following:

(i) From the differential equation by eliminating the arbitrary constant if $y = \text{A}\cos x + \text{B}\sin x$.

(ii) Solve $(1 + x^2)\,dy - x^2 \cdot y\,dx = 0$

c) Solve the D.E. $\frac{dq}{dt} + \frac{1}{RC}\,q = \frac{E}{R}$ given that $q = 0$ when $t = 0$ and E, R, C are constant.

6. Solve any TWO of the following: **12**

a) Attempt the following:

(i) Solve the equation by Gauss - Seidal method. (two iterations only)

$10x + y + 2z = 13, \quad 3x + 10y + z = 14, \quad 2x + 3y + 10z = 15$

(ii) Solve the following system of equation by using Jacobi-Iteration method. (two iterations)

$5x + 2y + z = 12, \quad x + 4y + 2z = 15, \quad x + 2y + 5z = 20$

b) Solve the following system of equations by using Gauss elimination method.

$x + 2y + 3z = 14, \quad 3x + y + 2z = 11, \quad 2x + 3y + z = 11$

c) Using Newton - Raphson method find the approximate root of the equation (use four iterations)

$x^2 + x - 5 = 0$