22224

12425

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

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

(2) Answer each next main Question on a new page.

(3) Figures to the right indicate full marks.

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

(5) 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) If $f(x) = x^3 + x^2 - 2$ find $f(1) - f(2)$

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

c) Find $\frac{dy}{dx}$ if $y = \sin(2x + 1)$

d) Evaluate : $\int (e^x + x^e + e^e)\ dx$

e) Evaluate : $\int \cos^2 x\ dx$

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

g) Show that the root of the equation $x^3 - 9x + 1 = 0$ lies between 2 and 3.

Marks

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

a) Find $\frac{dy}{dx}$ if $\sin y = \log(x + y)$

b) Find $\frac{dy}{dx}$ at $\theta = \frac{\pi}{4}$ if $x = a\cos^3\theta$ and $y = b\sin^3\theta$

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

d) A telegraph wire hangs in the form of a curve $y = a\log\left[\sec\left(\frac{x}{a}\right)\right]$ where a is constant. Show that the radius of curvature at any point is $a\cdot\sec\left(\frac{x}{a}\right)$

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

a) Find the equation of tangent and normal to the curve $y = x(2 - x)$ at $(2, 0)$.

b) Find $\frac{dy}{dx}$ if $y = x^x + x^{\sqrt{x}}$

c) Find $\frac{dy}{dx}$ if $y = \sqrt{\frac{1-\cos 2x}{1+\cos 2x}}$

d) Evaluate : $\int \frac{(\tan^{-1}x)^3}{1+x^2}\,dx$

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

a) Evaluate : $\int \frac{dx}{\sqrt{13-6x-x^2}}$

b) Evaluate : $\int \frac{1}{3+2\cos x}\,dx$

c) Evaluate : $\int e^x \sin 4x\,dx$

d) Evaluate : $\int \frac{1}{x(4+\log x)(3+\log x)}\,dx$

e) Evaluate : $\int_0^4 \frac{\sqrt[3]{x+5}}{\sqrt[3]{x+5}+\sqrt[3]{9-x}}\,dx$

Marks

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

a) Find the area between the parabolas $y^2 = 9x$ and $x^2 = 9y$

b) Attempt the following:

i) Form the differential equation of $y = Ae^x + Be^{-x}$.

ii) Solve $(3x^2 + 6xy^2)\,dx + (6x^2y + 4y^2)\,dy = 0$.

c) In a closed circuit the current I at time t is given by $E - RI - L\frac{dI}{dt} = 0$ Find the current I at time t, given that at t = 0, I = 0 and L, R, E are constants.

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

a) Attempt the following:

i) Solve the following system of equations by Jacobi's method (Perform 2 iterations only)

$5x + 2y + z = 12$

$x + 4y + 2z = 15$

$x + 2y + 5z = 20$

ii) Solve the following equations by Gauss-Seidal method (two iterations)

$10x + y + 2z = 13$

$3x + 10y + z = 14$

$2x + 3y + 10z = 15$

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

$6x - y - z = 19$

$3x + 4y + z = 26$

$x + 2y + 6z = 22$

c) Find the approximate root of the equation $x^3 - x - 1 = 0$ by using Newton-Raphson method. (Carry out four iterations)