22224

21222

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

15 minutes extra for each hour

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

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

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

(4) Figures to the right indicate full marks.

(5) Assume suitable data, if necessary.

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

(7) 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 $f(x) = 3x^2 - 5x + 7$, show that $f(-1) = 3\ f(1)$.

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

c) If $y = e^{x \log_e 5}$, find $\frac{dy}{dx}$.

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

e) Evaluate : $\int \frac{dx}{\sqrt{9 - 4x^2}}$

f) Find the order and degree of the following differential equation :

$$\frac{d^2y}{dx^2} + \sqrt{1 + \frac{dy}{dx}} = 0$$

g) Find a real root of the equation $x^3 - 4x - 9 = 0$ in the interval (2, 3) by using bisection method (Use two iterations)

P.T.O.

Marks

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

a) If $x^4 = e^{x-4}$, then prove that $\frac{dy}{dx} = \frac{\log x}{(1+\log x)^2}$.

b) If $x = 2\cos t - \cos 2t$, $y = 2\sin t - \sin 2t$, find $\frac{dy}{dx}$ at $t = \frac{\pi}{2}$.

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

d) Find the radius of curvature of the curve $y = \log(\sin x)$ at $x = \frac{\pi}{2}$.

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

a) Find the points on the curve $y = x^2 - 6x + 8$, where the tangent is parallel to x – axis.

b) If $y = \tan^{-1}\sqrt{\frac{1+\cos x}{1-\cos x}}$, find $\frac{dy}{dx}$.

c) Show that the right angled triangle whose hypotenuse is 60 cm has its area maximum when each of its remaining two sides is $30\sqrt{2}$ cm.

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

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

a) Evaluate : $\int \frac{dx}{1+\sin x}$

b) Evaluate : $\int \frac{(x-1)e^x}{x^2 \cdot \sin^2\left(\frac{e^x}{x}\right)}\,dx$

c) Evaluate : $\int \tan^{-1} x\,dx$

d) Evaluate : $\int_5^{10} \frac{dx}{(x-1)(x-2)}$

e) Evaluate : $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{1}{1+\sqrt[n]{\tan x}}\,dx$

Marks

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

a) Find the area bounded by the curve $y = \sin 2x$, for $0 \leq x \leq \pi$, and x-axis between $x = \frac{\pi}{3}$ and $x = \frac{3\pi}{4}$.

b) Solve the following:

i) Show that $y = A \sin x + B \cos x$ a solution of differential equation $\frac{d^2y}{dx^2} + y = 0$.

ii) Solve : $x\frac{dy}{dx} - y = x^2$

c) The acceleration of a particle is given by $\frac{d^2x}{dt^2} = 3t^2 - 6t + 8$. Find the distance covered in 2 seconds given that v = 0, $x = 0$ at $t = 0$.

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

a) Solve the following:

i) Find the root of the equation $\cos x - xe^x = 0$ using the regular-falsi method. (carry out two iterations)

ii) Solve the following system of equations by using Gauss Elimination method.

$2x + 3y + z = 13$, $x - y - 2z = -1$,
$3x + y + 4z = 15$.

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

$20x + y - 2z = 17$; $3x + 20y - z = -18$;
$2x - 3y + 20z = 25$.

c) Using Newton-Raphson method to find the approximate root of the equation $x \log_{10} x = 1.2$. (carry out three iterations)