22201

24225

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) 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) Define Even and Odd function.

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

c) Find $\frac{dy}{dx}$ if $y = x \cdot \tan x$

d) Evaluate : $\int \frac{dx}{1 + \cos 2x}$

e) Evaluate : $\int x^2 \log x \, dx$

f) Find the area bounded by the curve $y = \sin x$ and the X - axis from $x = 0$ to $x = \pi$.

g) State Simpson's $\left(\frac{3}{8}\right)^{th}$ rule of numerical integration.

P.T.O.

Marks

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

a) If $y = (\cos x)^{\sec x}$, find dy/dx

b) Find $\frac{dy}{dx}$ if $x^3 + y^3 = 3a\,xy$

c) The rate of working of an engine is given by the expression $10\,v + \frac{4000}{v}$, where v is the speed of the engine. Find the speed at which the rate of working is the least.

d) Find the radius of curvature to the curve $y = x^3$ at (2, 8).

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

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

b) If $x = \log(\sec\theta + \tan\theta)$, $y = \sec\theta$, find dy/dx at $\theta = \pi/4$.

c) If $y = \tan^{-1}\left[\frac{x}{1 + 12x^2}\right]$ find $\frac{dy}{dx}$

d) Evaluate : $\int \frac{x^2 \cdot \tan^{-1}(x^3)}{1 + x^6}\,dx$.

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

a) Evaluate : $\int \frac{1}{\sqrt{21 + 4x - x^2}}dx$

b) Evaluate : $\int \frac{1}{5 + 7\cos 2x}dx$

c) Evaluate : $\int x^3 \cdot e^{x^2}\,dx$

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

e) Evaluate : $\int_0^{\pi/2} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}}dx$

Marks

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

a) Find the area of the circle $x^2 + y^2 = r^2$ using integration.

b) i) Form the Differential equation of :

y = A cos 5x + B sin 5x, where A and B are arbitrary constants.

ii) Solve : $\frac{dy}{dx} = 1 + x + y + xy$

c) The circular column of radius 'x' and having depth 'y' supports a load. The equation of equilibrium is $2\frac{dx}{dy} - Kx = 0$ where K is constant. Find the relation between x and y.

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

a) i) Given :

x :	0	$\pi/8$	$\pi/4$
tan$x$:	0	0.4141	1

Evaluate : $\int_0^{\pi/4} f(x)\,dx$ using Trapezoidal rule.

ii) Evaluate : $\int_0^4 e^x\,dx$ using Simpson's one - third rule by dividing the interval (0, 4) into four equal parts.

Given : e = 2.72, $e^2 = 7.39$, $e^3 = 20.09$, $e^4 = 54.60$

b) Using Simpson's one-third rule,

Evaluate : $\int_0^{\pi/2} \sqrt{\sin x}\,dx$. Divide the interval into eight equal sub-intervals.

c) Evaluate : $\int_0^8 e^x\,dx$ using Simpson's $\left(\frac{3}{8}\right)^{th}$ rule, taking n = 8

Given : e = 2.72