22210

12425

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

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

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

c) Find $\frac{dy}{dx}$ if $y = x^5 + 3^x + e^x + \sin x$.

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

e) Evaluate : $\int x \cdot \log x \, dx$

f) Find area between the lines $y = 2x$, x-axis and ordinates $x = 1$ and $x = 3$

g) If $Z_1 = 4 - 5i$ and $Z_2 = 3 + 7i$ Find $| Z_1 + Z_2 |$

Marks

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

a) Find $\frac{dy}{dx}$ if $x^2 + y^2 = 4xy$ at point (2, –1).

b) If $y = (\sin x)^{\log x}$. Find $\frac{dy}{dx}$.

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

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

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

a) Find the maxima and minima of $y = x^3 - 9x^2 + 24x$.

b) Find $\frac{dy}{dx}$ if $y = x^{\sin x} + (\tan x)^x$.

c) If $x = a(2\theta - \sin 2\theta)$, $y = a(1 - \cos 2\theta)$, find $\frac{dy}{dx}$ at $\theta = \frac{\pi}{4}$

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

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

a) Evaluate : $\int \frac{dx}{x^2+4x+5}$

b) Evaluate : $\int \frac{dx}{4+5\cos x}$

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

d) Evaluate : $\int \frac{x+1}{x(x^2-4)}\, dx$

e) Evaluate : $\int_0^{\pi/2} \frac{\sqrt[3]{\sin x}}{\sqrt[3]{\cos x} + \sqrt[3]{\sin x}}\, dx$

Marks

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

a) Find the area of an ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$ by integration.

b) Attempt the following:

i) Form the differential equation if $y = \cos(x + a)$

ii) Solve the differential equation
$x(1 + y^2)dx + y(1 + x^2)dy = 0$.

c) The quantity of a charge of coulombs passes through a conducting wire during small interval of time t sec is given by $\frac{dq}{dt} = i$ where i is current in ampere. If $i = 10 \sin 100t$ and that $q = 0$, $t = 0$ find the charge at time t.

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

a) i) Attempt the following:

If $Z_1 = -3 + 4i$, $Z_2 = 5 - 3i$

Express $\frac{Z_1}{Z_2}$ in $x + iy$ form

ii) Find $L\{e^{3t} \cdot t^2\}$

b) Find : $L^{-1}\left\{\frac{2s^2-4}{(s+1)(s-2)(s-3)}\right\}$

c) Solve the differential equation using Raplace Transform
$\frac{dy}{dt} + 2y = e^{-t}$, given $y(0) = 2$.