22210

24225

3 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 $f(x) = 27^x - \log_3 x$. Find $f\left(\frac{1}{3}\right)$.

b) If $f(x) = x^3 - 3x + \sin x$ check whether the function $f(x)$ is odd or even.

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

d) Evaluate : $\int \frac{1}{3x - 20}\, dx$

e) Evaluate : $\int \frac{1}{x \,.\, \log x}\, dx$

f) Find area bounded by the curve $y = e^x$ from the ordinates $x = 0$ to $x = 1$.

g) Express $z = (3 + 2i) \,.\, (1 - i)$ in the form of $a + ib$.

Marks

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

a) Find $\frac{dy}{dx}$ if $x \cdot \sin y + y \cdot \sin x = 5$

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

c) A fence of length '100' m is to be used to form three sides of a rectangular enclosure, the fourth side being a wall. Find the maximum area which can be enclosed by the fence.

d) Find the radius of curvature of the curve $y^2 = 4ax$ at the point (a, 2a).

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

a) Find equation of tangent to the curve $y = 9x^2 - 12x + 7$ which is parallel to x-axis.

b) Find $\frac{dy}{dx}$ if $y = \sin^{-1}\left[\frac{\cos x + \sin x}{\sqrt{2}}\right]$

c) Find $\frac{dy}{dx}$ if $y = x^x + a^x + x^x + a^a$

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

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

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

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

c) Evaluate : $\int \frac{1}{4\sin^2 x + 5\cos^2 x}\, dx$

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

e) Evaluate : $\int_0^7 \frac{\sqrt[3]{x}}{\sqrt[3]{x} + \sqrt[3]{7 - x}}\, dx$

Marks

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

a) Find area bounded between the parabolas, $y^2 = 8x$ and the straight line $y = 2x$.

b) **Solve the following:**

i) Find order and degree of differential equation

$$\sqrt{\frac{dy}{dx}} = \sqrt[3]{\frac{d^2y}{dx^2}}$$

ii) Solve : $\frac{dy}{dx} + y \cdot \tan x = \cos^2 x$

c) A resistance of 100 ohms and an inductance of 0.1 henries are connected in a series with battery of 20 volts. Find current in circuit at any time 't' if $L \cdot \frac{di}{dt} + Ri = E$

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

a) **Solve the following:**

i) Express $z = -1 + i$ in Polar form.

ii) Find $L\{e^{-2t} \cdot \sin 4t\}$

b) Find $L^{-1}\left\{\frac{2s+3}{(s+2)(s+6)}\right\}$

c) Using Laplace transform solve the differential equation.

$\frac{dy}{dt} - y = 3e^{-2t}$ if $y(0) = -1$
