22206

24225

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) 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) Test whether the function is even or odd if $f(x) = x^3 + 4x + \sin x$.

b) If $f(x) = x^2 + 6x + 10$ find $f(2) + f(-2)$

c) Find $\frac{dy}{dx}$ if $y = \log x + \log_5 x + \log_5 5$

d) Evaluate $\int \cos^2 x \, dx$.

e) Evaluate $\int (x^a + a^x + e^x + a^a) \, dx$

f) Find area bounded by the curve $y = x^3$, x axis and the ordinates $x = 1$ to $x = 3$.

g) If a fair coin is tossed three times, find the probability of getting exactly two heads.

P.T.O.

Marks

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

a) If $x^2 + y^2 = 4xy$ find $\frac{dy}{dx}$ at $(2, -1)$

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

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

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

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

a) Find the equation of tangent and normal to the curve $4x^2 + 9y^2 = 40$ at $(1, 2)$.

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

c) Find $\frac{dy}{dx}$ if $y = \tan^{-1}\left(\frac{x}{1 + 12x^2}\right)$

d) Evaluate : $\int \frac{\sin\sqrt{x}}{\sqrt{x}}\,dx$

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

a) Evaluate : $\int \frac{1}{\sqrt{1-x^2}\,(\sin^{-1}x)^2}\,dx$

b) Evaluate : $\int \frac{1}{5 + 4\cos x}\,dx$

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

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

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 bounded by the parabolas $y^2 = 4x$ and $x^2 = 4y$

b) **Solve the following**

i) Form the differential equation by eliminating the arbitrary constants of $y = A\cos 3x + B\sin 3x$.

ii) Solve : $e^{x+y}\,dx + e^{2y-x}\,dy = 0$

c) A body moves according to the law of motion given by $\frac{d^2x}{dt^2} = 3t^2$ find its velocity at $t = 1$ and $v = 2$

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

a) i) An unbiased coin is tossed 5 times. Find Probability of getting three heads.

ii) Fit a Poisson's distribution for the following observations.

x_i	20	30	40	50	60	70
f_i	8	12	30	10	6	4

b) The number of road accidents met with by taxi drivers follow Poisson distribution with mean 2. Out of 5000 taxis in the city, find the number of drivers

i) Who does not meet an accident

ii) Who met with an accidents more than 3 times. (Given $e^{-2} = 0.1353$).

c) In a certain examination 500 students appeared. Mean score is 68 with S.D.8 Find the number of students scoring,

i) less than 50

ii) more than 60.

(Given area between $z = 0$ to $z = 2.25$ is 0.4878 and area between $z = 0$ and $z = 1$ is 0.3413)