22206

23242

3 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 $f(-1) = 3\,f(1)$.

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 $\int x \cdot e^x \; dx$

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

g) An unbiased coin is tossed seven times. Find probability of getting three heads.

P.T.O.

Marks

2. Solve any <u>THREE</u> of the following: **12**

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

b) If $y = (\sin x)^x$ 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 of the curve $\sqrt{x} + \sqrt{y} = 1$ at $\left(\frac{1}{4}, \frac{1}{4}\right)$.

3. Solve any <u>THREE</u> of the following: **12**

a) Find the maximum and minimum values of $x^3 - 9x^2 + 24x$.

b) Find $\frac{dy}{dx}$, if $y = \frac{e^x + e^{-x}}{e^x - e^{-x}}$.

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

d) Evaluate $\int \frac{e^x(x+1)}{\cos^2(x\cdot e^x)}\,dx$

4. Solve any <u>THREE</u> of the following: **12**

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

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

c) Evaluate $\int_0^{\pi/4} \log\,(1 + \tan x)\,dx$.

d) Evaluate $\int \frac{\log x}{x\cdot(2+\log x)\cdot(3+\log x)}\,dx$.

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

Marks

5. Solve any <u>TWO</u> 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) In an electric circuit containing inductance and resistance in series with constant e.m.f. E gives the differential equation $L\frac{dI}{dt}+RI = E$ if initial current is zero. Find the current I at any time t.

6. Solve any <u>TWO</u> of the following: **12**

a) Number of road accidents follows a Poisson's distribution with mean 5. Find the probability that in a certain month number of accidents on the high way will be

i) less than 3.

ii) more than 3. [Given $e^{-5} = 0.0067$]

b) IQ's are normally distributed with mean 100 and standard deviation 15. Find the probability that a randomly selected person has:

i) An I.Q. more than 130.

ii) An I.Q. between 5 and 115.

[Z = 2, Area = 0.4772,

Z = 1, Area = 0.3413]

c) The probability that a pen manufactured by a company will be defective is $\frac{1}{10}$. If 12 such pens are manufactured. Find the probability that:

i) Exactly two will be defective

ii) At least two will be defective

iii) None will be defective.