22206

11920

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. Attempt any <u>FIVE</u> of the following: **10**

a) If, $f(x) = x^2 - x + 1$, then find $f(0) + f(3)$.

b) Show that, $f(x) = \dfrac{a^x + a^{-x}}{2}$ is an even function.

c) Find $\dfrac{dy}{dx}$, if $y = x^5 + 5^x + e^x + \log_2 x$

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

e) Evaluate, $\displaystyle\int x \cdot e^x \cdot dx$

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

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

Marks

2. Attempt any THREE of the following: 12

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

b) If, $x = a\cos^3\theta$ and $y = b\sin^3\theta$. Find $\frac{dy}{dx}$ at $\theta = \frac{\pi}{3}$

c) A telegraph wire hangs in the form of a curve $y = a.\log\left[\sec\left(\frac{x}{a}\right)\right]$. Where a is constant. Show that, radius of curvature at any point is $a \cdot \sec\left(\frac{x}{a}\right)$.

d) A beam is supported at the two ends and is uniformly loaded. The bending moment M at a distance x from the end is given by $M = \frac{W1}{2} \times x - \frac{W}{2} \times x^2$. Find the point at which M is maximum.

3. Attempt any THREE of the following: 12

a) Find the equation of tangent and normal to the curve $y = x^2$ at point (–1,1)

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, $\int \frac{(\sin^{-1}x)^3}{\sqrt{1-x^2}}\,dx$.

4. Attempt any THREE of the following: 12

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

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

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

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

e) Evaluate, $\int_0^{\pi/2} \frac{1}{1+\tan x}\,dx$

Marks

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

a) Find area bounded by the curve $y^2 = 4x$ and $x^2 = 4y$.

b) Attempt the following:

(i) Form a differential equation by eliminating arbitary constant if $y = A.\cos(\log x) + B\sin(\log x)$.

(ii) Solve, $x(1 + y^2)\,dx + y \cdot (1 + x^2)\,dy = 0$.

c) A particle starting with velocity 6 m/s. has an acceleration $(1 - t^2)$ m/s^2. When does it first come to rest? How far has it then travelled?

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

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

(ii) Fit a poissons distribution for the following observations.

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

b) If 2% of the electric bulbs manufactured by a company are defective. Find the probability that in sample of 100 bulbs

(i) 3 are defective

(ii) At least two are defective.

c) In a sample of 1000 cases, the mean of certain test is 14 and standard deviation is 2.5. Assuming the distribution is to be normal,

(i) How many students score between 12 and 15.

(ii) How many students score above 18.

Given

Frequency 0 to 0.8 = 0.2881

Frequency 0 to 0.4 = 0.1554

Frequency 0 to 1.6 = 0.4452.