17349

11819

3 Hours / 100 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) Assume suitable data, if necessary.

(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.

(7) Use of Steam tables, logarithmic, Mollier's chart is permitted.

Marks

1. Solve any TEN of the following: **20**

a) Find the point on the curve $y = e^x$ if the slope is 1

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

c) Evaluate $\int (\sin x + \cos x)^2 \cdot dx$

d) Evaluate $\int \frac{e \tan^{-1} x}{1 + x^2} \cdot dx$

e) Evaluate $\int \frac{1}{x^2 + 3x + 2} \cdot dx$

f) Evaluate $\int x \cdot \sin x \cdot dx$

g) Evaluate $\int_1^2 \frac{dx}{3x - 2}$

P.T.O.

Marks

h) Find the area above the x-axis bounded by $y = \sin x$ and the ordinate $x = \frac{\pi}{6}$ and $x = \pi/3$

i) Find order and degree of $\frac{d^2y}{dx^2} + \sqrt{1 + \frac{dy}{dx}} = 0$

j) Form a differential if $y = A\sin x + B\cos x$

k) Form a differential if $y = ax^2 + b$

l) Find the probability of getting sum of numbers is 9 with two dice.

2. Solve any FOUR of the following: **16**

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

b) Find the radius of curvature of the curve $\sqrt{x} + \sqrt{y} = 1$ at $\left(\frac{1}{4}, \frac{1}{4}\right)$

c) Find the maximum and minimum value of $x^3 - 9x^2 + 24x$

d) Evaluate $\int \frac{\left(\tan^{-1}x\right)^3}{1 + x^2}\, dx$

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

f) Evaluate $\int \frac{dx}{3x^2 + 2x + 5}$

3. Solve any FOUR of the following: **16**

a) Evaluate $\int_0^{\pi/2} \frac{\cos x}{4 - \sin^2 x}\, dx$

b) Evaluate $\int_0^{\pi/4} \log(1 + \tan x) \cdot dx$

c) Find the area of an ellipse $4x^2 + 9y^2 = 36$ by integration.

d) Solve $\frac{dy}{dx} = \cos(x + y)$

e) Solve the D. E $\frac{dy}{dx} = \frac{x^2 + y^2}{x \cdot y}$

f) Solve $(x + 1) \cdot \frac{dy}{dx} - y = e^x (x + 1)^2$

Marks

4. Solve any FOUR of the following: **16**

a) Evaluate $\int_1^4 \frac{\sqrt{5-x}}{\sqrt{x}+\sqrt{5-x}}\, dx$

b) Evaluate $\int_0^{\pi/2} dx/4+5\cos x$

c) Find the area of the circle $x^2+y^2=64$ by integration.

d) Solve $\frac{dy}{dx}=e^{2x+y}+x^2\cdot e^y$

e) Solve $(2x+3\cos y)\cdot dx+(2y-3x\sin y)\cdot dy=0$

f) Show that y = A sin(mx) + B cos(mx) is a solution of D.E.

$$\frac{d^2y}{dx^2}+m^2y=0$$

5. Solve any FOUR of the following: **16**

a) A problem is given to three student A, B and C whose chances of solving it are $1/2$, $1/3$, $1/4$ respectively. If they attempt to solve problem independently find the probability that problem is solved by at least one of them.

b) If 30% of bulbs produced are defective find the probablity that out of 4 bulbs selected

(i) one is defective

(ii) At most 2 are defective

c) Evaluate $\int dx/2+3\cos x$

d) Fit a poisson distribution for the following observations.

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

e) Evaluate $\int \tan^{-1}x\cdot dx$

f) Solve $\frac{dy}{dx}=(4x+y+1)^2$

Marks

6. Solve any FOUR of the following: **16**

a) A bag contains 20 tickets numbered from 1 to 20. One ticket is drawn at random. Find the probability that it is numbered with multiple of 3 or 5.

b) A firm produces articles of which 0.1% are defective out of 500 articles. If wholesaler purchases 100 such cases how many can be expected to have one defective (Given $e^{-0.5} = 0.6065$)

c) I.Q 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 85 and 115

(Given A(z = 2) = 0·4772, A(z = 1) = 0·3413)

d) Divide 100 in two parts such that their product is maximum.

e) The equation of the tangent at the point (2, 3) on the curve $y = ax^3 + b$ is $y = 4x - 5$. Find the values of a and b

f) Find the area bounded by two parabola $y^2 = 2x$ and $x^2 = 2y$