



17301

15162

3 Hours / 100 Marks

Seat No.

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- 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. Attempt any ten :

20

- a) Find the radius of curvature of the curve $y = x^3$ at $(2, 8)$.
- b) At which point on the curve $y = 3x - x^2$, the slope of tangent is -5 ?
- c) Evaluate : $\int \frac{2x^3 + 5x^2 + 4}{\sqrt{x}} dx$.
- d) Evaluate : $\int \sin^2(2x) dx$.
- e) Evaluate : $\int \frac{1}{x \cdot \log x} dx$.
- f) Evaluate : $\int x^2 \cdot e^x dx$.
- g) Evaluate : $\int_2^4 \frac{1}{2x+3} dx$.
- h) Find the area under the curve $y = e^x$ from the ordinate $x = 0$ to $x = 1$.

P.T.O.



i) Find the order and degree of the equation $\left[1 + \left(\frac{dy}{dx}\right)^3\right]^{5/3} = 2 \frac{d^2y}{dx^2}$.

j) Find the differential equation from the relation $y = Ae^{mx}$.

k) Three fair coins are tossed. Find the probability that atleast two heads appear.

d) Five men in a company of 20 are graduates. If 3 men are picked up out of 20 at random, what is probability that they all are graduates ?

2. Attempt any four :

16

a) Evaluate : $\int \frac{(\tan^{-1} x)^3}{1+x^2} dx$.

b) Evaluate : $\int \frac{x}{\sqrt{9+8x-x^2}} dx$.

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

d) Find the maximum and minimum value of $y = x^3 - 9x^2 + 24x$.

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

f) Show that equation of tangent to $\left(\frac{x}{a}\right)^m + \left(\frac{y}{b}\right)^m = 2$ at the point (a, b) is $\frac{x}{a} + \frac{y}{b} = 2$.

3. Attempt any four :

16

a) Evaluate : $\int_0^{\pi/2} \frac{dx}{5+4\cos x}$.

b) Evaluate : $\int_0^{\pi/2} \frac{\sin x - \cos x}{1 + \sin x \cdot \cos x} dx$.



- c) Find by integration the area of the ellipse $4x^2 + 9y^2 = 36$.
- d) Find the particular solution of D.E. $y\sqrt{1-x^2} dy + x\sqrt{1-y^2} dx = 0$ when $x = \frac{3}{4}$, $y = \frac{4}{5}$.
- e) Solve the D.E. : $\frac{dy}{dx} = \frac{(x+y)^2}{xy}$.
- f) Solve the D.E. : $x \cdot \frac{dy}{dx} - y = x^2 \cos^2 x$.

4. Attempt any four :**16**

- a) Evaluate : $\int \frac{x}{(x^2-1)(x^2+2)} dx$.
- b) Evaluate : $\int_0^7 \frac{\sqrt[3]{x}}{\sqrt[3]{x} + \sqrt[3]{7-x}} dx$.
- c) Find the area enclosed between the parabola $y = x^2$ and the line $y = 4$.
- d) A problem is given to the three students Sumit, Amit and Akbar, whose chances of solving it are $\frac{1}{2}$, $\frac{1}{3}$ & $\frac{1}{4}$ respectively. If they attempt to solve a problem independently, find the probability that the problem is solved by atleast one of them.
- e) In sampling a large number of parts manufactured by a machine, the mean number of defectives in a sample of 20 is 2. Out of 1000 such samples, how many would be expected to contain atleast 3 defective parts.
- f) In a certain examination 500 students appeared. Mean score is 68 with S.D. 8. Find the number of students scoring.
- Less than 50
 - More than 60.
- (Given that area between $z = 0$ to $z = 2.25$ is 0.4878 and area between $z = 0$ to $z = 1$ is 0.3413).



5. Attempt **any four** :

a) Evaluate : $\int_0^{\pi/2} \frac{\sin x \cdot \cos x}{\cos^2 x + 3 \cos x + 2} dx$.

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

c) Find the area enclosed between the parabolas $y^2 = 4x$ and $x^2 = 4y$.

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

e) Solve D.E. : $(2xy + y^2) dx + (x^2 + 2xy + \sin y) dy = 0$.

f) Solve D.E. : $x \cdot \frac{dy}{dx} - y = x^2$.

6. Attempt **any four** :

16

a) Divide 80 into two parts such that their product is maximum.

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

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

d) A box contains 7 red, 5 white and 8 green balls identical in all respects except colour. One ball is drawn at random. Find the probability that it is not white.

e) Two unbiased dice are thrown in the air. Find the probability that the sum of the score is greater than nine or an even number.

f) In a test on 2000 electric bulbs, it was found that the life of particular make was normally distributed with average life of 2040 hours and standard deviation of 60 hours. Estimate the no. of bulbs likely to burn for :

i) between 1920 hours and 2160 hours

ii) more than 2150 hours

Given that : $A(2) = 0.4772$, $A(1.83) = 0.4664$.
