

22201

21718

3 Hours / 70 Marks

Seat No.

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- 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.

Marks

1. Attempt any FIVE of following :

10

- (a) If $f(x) = x^4 - 2x + 7$, find $f(0) + f(2)$.
- (b) State whether the function $f(x) = \frac{e^x + e^{-x}}{2}$ is odd or even.
- (c) If $y = \log(x^2 + 2x + 5)$ then find $\frac{dy}{dx}$.
- (d) Evaluate : $\int \frac{1 - \cos 2x}{1 + \cos 2x} dx$.
- (e) Evaluate : $\int \frac{1}{2x + 5} dx$.
- (f) Find the area under the parabola $y^2 = 4x$ bounded by the lines $x = 0$, $y = 0$, $x = 4$.
- (g) State the trapezoidal rule of numerical integration.

2. Attempt any THREE of the following :

12

- (a) If $x^y = e^{x-y}$ then prove that $\frac{dy}{dx} = \frac{\log x}{(1 + \log x)^2}$
- (b) If $x = a(\theta - \sin \theta)$, $y = a(1 - \cos \theta)$, then find $\frac{dy}{dx}$ at $\theta = \frac{\pi}{4}$
- (c) Find maximum and minimum value of $y = x^3 - 18x^2 + 96x$.
- (d) Find radius of curvature of the curve $y = x^3$ at $(2, 8)$.

3. Attempt any THREE of the following :

12

- (a) Find $\frac{dy}{dx}$ if $y = x^x + (\sin x)^x$.
- (b) Find $\frac{dy}{dx}$ if $x^2 + 3xy + y^2 = 5$.
- (c) Evaluate : $\int \frac{\log (\tan x/2)}{\sin x} dx$.
- (d) Find the equation of the tangent to the circle $x^2 + y^2 + 6x - 6y - 7 = 0$ at a point it cuts the x -axis.

4. Attempt any THREE of the following :

12

- (a) Evaluate : $\int \frac{1}{5 + 4 \cos x} dx$.
- (b) Evaluate : $\int \frac{x + 1}{x(x^2 - 4)} dx$.

- (c) Evaluate : $\int \cos (\log x) dx$.
- (d) Evaluate : $\int \frac{1}{x^2 + 4x + 9} dx$.
- (e) Evaluate : $\int_1^5 \frac{\sqrt{9-x}}{\sqrt{9-x} + \sqrt{x+3}} dx$.

5. Attempt any TWO of the following :

12

- (a) Find the area of the loop of a curve $y^2 = x^2(1-x)$.
- (b) Attempt the following :
- (i) Form the differential equation of $y = a \sin x + b \cos x$.
- (ii) Solve : $\frac{dy}{dx} + \frac{y}{x} = x^2$.
- (c) A resistance of 100Ω and inductance of 0.1 henries are connected in series with a battery of 20 volts. Find the current in the circuit at any instant, if the relation between L , R and E is

$$L \frac{di}{dt} + Ri = E.$$

6. Attempt any TWO of the following :

12

- (a) (i) Using trapezoidal rule, evaluate $\int_0^6 f(x) dx$ given by.

x	0	1	2	3	4	5	6
$f(x)$	1	0.5	0.3333	0.25	0.2	0.6666	0.1428

P.T.O.

- (ii) Using Simpson's 1/3rd rule, evaluate $\int_1^2 \frac{1}{x} dx$ given by

x	1	1.25	1.5	1.75	2
$y = f(x)$	1	0.8	0.6666	0.5714	0.5

- (b) Evaluate $\int_0^1 \frac{1}{1+x^2} dx$. Using Simpson's 1/3rd rule divide the interval $[0, 1]$ into

six equal parts. Find approximate value of π .

- (c) Evaluate $\int_0^6 \frac{1}{1+x^2} dx$ by using Simpson's 3/8th rule.
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