**SECTION A (50 marks)**

**ANSWER ALL THE QUESTIONS**

**QUESTION A1 (5 Marks)**

$$\int 5x^3 - 3x^2 + 1 - \frac{2}{\sqrt{x}}\,dx$$

**QUESTION A2 (5 Marks)**

$$\int \frac{1}{1-x^2}\,dx$$

**QUESTION A3 (5 Marks)**

$$\int \frac{e^x}{1+e^x}\,dx$$

**QUESTION A4 (5 Marks)**

Evaluate $\int_0^1 \frac{1}{\sqrt{1+3x}}\,dx$

**QUESTION A5 (5 Marks)**

Evaluate $\int\left(\frac{2t^4+t^2-2}{t^4}\right)dt$

**QUESTION A6 (5 Marks)**

Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ for $y = 4x^3 - 5x^2 + 8$

**QUESTION A7 (5 Marks)**

Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ for $y = (2x-7)^5$

**QUESTION A8 (5 Marks)**

Find the gradient for the curve $xy(x + y) = 6$ at the point (1,2).

**QUESTION A9 (5 Marks)**

If $y = (ax+2)^2$ and $\frac{d^2y}{dx^2} = 18$, find the values of $a$.

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**QUESTION A10 (5 Marks)**

Differentiate $\frac{4}{x^2+3}$ with respect to $x$.

**SECTION B (50 MARKS)**
**ANSWER ALL THE QUESTIONS**

**QUESTION B1 (25 Marks)**

(a) Find $\frac{dy}{dx}$ in the following cases:

(i) $y = 3x^4 - 2x^2 + x - 2 + \frac{4}{\sqrt{x}}$

[5 marks]

(ii) $y = \frac{1+e^{2x}}{x+e^x}$

[7 marks]

(iii) $y = \left(2x - \frac{1}{2x}\right)^3$

[7 marks]

(b) $\int \left(2x + \frac{3}{2x}\right)^2 dx$

[6 marks]

**QUESTION B1 (25 Marks)**

(a) Evaluate

(i) $\int_1^2 \left(x - \frac{1}{x^2}\right) dx$

[6 marks]

(ii) $\int_1^2 \frac{x+1}{x^3} dx$

[6 marks]

(b) Given that $\int_0^4 p(x)dx = 6$, evaluate

(i) $\int_0^4 3p(x)dx$

[3 marks]

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(ii) $\int_0^4 [2 - p(x)]dx$

[4 marks]

(c) Find $\int \left( \frac{1}{x^2} - \frac{1}{x^3} \right) dx$

[6 marks]

## Formulae

Quadratic equation

| | |
|---|---|
| If $ax^2 + bx + c = 0, \quad a \neq 0$<br>$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ | If $ax^2 + bx + c = 0, \quad a \neq 0$ has roots $\alpha$ and $\beta$,<br>$\alpha + \beta = -\frac{b}{a}, \quad \alpha\beta = \frac{c}{a}$ |

Exponential and logarithm

| | |
|---|---|
| $a^m \times a^n = a^{m+n}$<br>$a^m \div a^n = a^{m-n}$<br>$(a^m)^n = a^{mn}$<br>$(ab)^n = a^n b^n$<br>$a^{-n} = \frac{1}{a^n}$<br>$a^{\frac{m}{n}} = \sqrt[n]{a^m} = (\sqrt[n]{a})^m$<br>$a^0 = 1$ | $\log_a (xy) = \log_a x + \log_a y$<br>$\log_a (\frac{x}{y}) = \log_a x - \log_a y$<br>$\log_a x^n = n \log_a x$<br>$\log_a a = 1$<br>$\log_a 1 = 0$<br>$\log_a b = \frac{\log_c b}{\log_c a}$ |

Differentiation and Integration

| | |
|---|---|
| $\frac{d}{dx}(ax^n) = anx^{n-1}$<br>$\frac{d}{dx}(\ln x) = \frac{1}{x}$<br>If $y = u$, $\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$<br>If $y = uv$, $\frac{dy}{dx} = u\frac{dv}{dx} + v\frac{du}{dx}$ | $\frac{d}{dx}(ae^{kx}) = ake^{kx}$<br>$\frac{d}{dx}(\log_a u) = \frac{u'}{u \ln a}$<br>If $y = \frac{u}{v}$, $\frac{dy}{dx} = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2}$ |

SAMPLE COPY

Integration

| | |
|---|---|
| $\int ax^n dx = \frac{ax^{n+1}}{n+1} + c, \quad n \neq -1$ | $\int e^{ax+b} dx = \frac{1}{a} e^{ax+b} + c$ |
| $\int (ax+b)^n dx = \frac{(ax+b)^{n+1}}{a(n+1)} + c, \quad n \neq -1$ | $\int \frac{f'(x)}{f(x)} dx = \ln \mid f(x) \mid + c$ |
| $\int \frac{1}{x} dx = \ln \mid x \mid + c$ | $\int a^x dx = \frac{a^x}{\ln a} + c$ |
| $\int \frac{1}{ax+b} dx = \frac{1}{a} \ln \mid ax+b \mid + c$ | $\int f(g(x)).g'(x) dx = F(g(x)) + c$ |
| $\int e^x dx = e^x + c$ | |

SAMPLE COPY