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|---|-------|
| VIII (a) Evaluate $\lim_{x \rightarrow 0} \frac{\sin mx}{\sin nx}$. | 5 |
| (b) Find $\frac{dy}{dx}$ if $y = \frac{e^x \cos x}{x^2 + \sin x}$. | 5 |
| (c) If $y = a \cos (\log x) + b \sin (\log x)$. Prove that $x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx} + y = 0$. | 5 |

UNIT — IV

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| IX (a) A spherical balloon is inflated by pumping 25cc of gas per second. Find the rate at which the radius of the balloon is increasing when the radius of the balloon is 15cm. | 5 |
| (b) Find the range of values of x for which $x^2 - 3x + 4$ is
(i) Increasing (ii) Decreasing | 5 |
| (c) Prove that a rectangle of fixed perimeter has its maximum area when it becomes a square. | 5 |

OR

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| X (a) Find the turning values of $2x^3 - 9x^2 + 12x + 2$. | 5 |
| (b) Find the velocity and acceleration of a particle at $t = 3$ seconds whose displacement is given by $S = 3t^3 - t^2 + 9t + 1$. | 5 |
| (c) An open box is to be made out of a square sheet of side 18cm by cutting off equal squares at each corner and turning up the sides. What size of the squares should be cut in order that the volume of the box may be maximum. | 5 |
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