

b) Solve $(y^4 + 2y)dx + (xy^3 + 2y^4 - 4x)dy = 0$ 4M

OR

6. a) Show that the family of curves $\frac{x^2}{a^2 + \lambda} + \frac{y^2}{b^2 + \lambda} = 1$ are self orthogonal. 4M

b) Suppose that an object is heated to 300F and allowed to cool in a room whose air temperature 20F, it after 10 min, the temperature of the object is 250F, what will be its temperature after 20 min? 4M

7. a) Solve $(D^2 - 2D + 1)y = xe^x \sin x$ 4M

b) Solve $(D^2 - 2D)y = e^x \sin x$ by variation of parameters 4M

OR

8. Solve $x^3 \frac{d^3 y}{dx^3} + 2x^2 \frac{d^2 y}{dx^2} + 2y = 10 \left(x + \frac{1}{x} \right)$ 8M

9. a) Find $L \{ te^{-t} \sin 4t \}$ 4M

b) Evaluate $\int_0^{\infty} \left(\frac{e^{-at} - e^{-bt}}{t} \right) dt$ 4M

OR

10. Solve $y'' + 3y' + 2y = 2t^2 + 2t + 2$, $y(0) = 2$, $y'(0) = 0$ using Laplace Transforms 8M