Don Bosco Institute of Technology, Kurla
FEC201 Engineering Mathematics - II
QUESTION BANK FOR INTERNAL ASSESSMENT (Sem II) (ATKT- 2023)

MODULE 1 - DE of First order and First degree (2 MARKS)

1. Find the integrating factor of $(x^2e^x - my)dx + mxdy = 0$.
2. Solve $(4xy + 3y^2 - x)dx + x(x + 2y)dy = 0$, if the integrating factor of given differential equation is x^2.
3. Solve $\frac{d^4y}{dx^4} + 2\frac{d^2y}{dx^2} + y = 0$.
4. Find the integrating factor of $\frac{dr}{d\theta} = r\ tan\ \theta - \frac{r^2}{cos\ \theta}$.
5. Solve $(xy^3 + y)dx + 2(x^2y^2 + x + y^4)dy = 0$, if the integrating factor of given differential equation is y.
6. Reduce the differential equation $3x(1 - x^2)y^2\frac{dy}{dx} + (2x^2 - 1)y^3 = ax^3$ into linear differential equation .
7. Solve $y\ log\ y\frac{dx}{dy} + x - log\ y = 0$, if the integrating factor is $log\ y$.
8. Find the value of α so that $e^{\alpha x^2}$ is an integrating factor of the differential equation $x(1 - y)dx - dy = 0$

MODULE 2 - LDE with constant coefficients and variable coefficients of Higher order (2 MARKS)

1. Solve $\frac{d^4y}{dx^4} + 2\frac{d^2y}{dx^2} + y = 0$.
2. Solve $[(D^2 + 1)^3\ (D^2 + D + 1)^2]y = 0$.
3. Find the particular integral of $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = e^x + 1$.
4. Find the Particular Integral of $\frac{d^4y}{dx^4} - y = cos\ x$.
5. Solve $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} - 5y = 0$.

MODULE 1 - DE of First order and First degree (5 MARKS)

1. Solve $(xy^2 - e^{\frac{1}{x^3}})dx - (x^2y)dy = 0.$
2. Solve: $(xy^3 + y)dx + 2(x^2y^2 + x + y^4)dy = 0.$
3. Solve $x^2y - x^3\frac{dy}{dx} = y^4 cos\ x.$
4. Solve $4xy\frac{dy}{dx} = (y^2 + 3) + x^3(y^2 + 3)^3.$
5. Solve $\frac{dy}{dx} + (\frac{x}{1 - x^2})y = x\sqrt{y}.$

MODULE 2 - LDE with constant coefficients and variable coefficients of Higher order(5 MARKS)

1. Solve $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = x^2 + e^x + sin2x.$
2. Solve: $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = 8(x^2 + sin2x).$
3. Solve $x^2y - x^3\frac{dy}{dx} = y^4 cos\ x.$
4. Solve: $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = xe^{-x}cosx$
5. Solve using Method of Variation of Parameter
   a) $\frac{d^2y}{dx^2} + 5\frac{dy}{dx} + 6y = e^{-2x}sec^2x(1 + 2\tan x).$
   b) $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = e^{e^x}.$