DIFFERENCIAL EQUATION {BSCS-3rd(M)}

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-: Objective :-

1- A

2- C

3- C

4- A

5- A

6- C

7- B

8- B

9- D

10- C

11- B

12- A

:- Subjective :-

QUESTION : 01

Solve $\frac{dy}{dx} = \frac{y-x+1}{y-x+5}$

$$\frac{dy}{dx} = \frac{y-x+1}{y-x+5} \quad \text{---} \quad (1)$$

Put $y-x = z$ in (1).

$$\frac{dy}{dx} - 1 = \frac{dz}{dx}$$

$$\frac{dy}{dx} = 1 + \frac{dz}{dx}$$

$$1 + \frac{dz}{dx} = \frac{z+1}{z+5}$$

$$\frac{dz}{dx} = \frac{z+1}{z+5} - 1$$

$$\frac{dz}{dx} = \frac{z+1-z-5}{z+5}$$

$$= -4/z+5$$

By Applying Integration:

$$\int (z+5)\, dz = -4 \int du$$

$$\frac{z^2}{2} + 5z = -4u + C$$

$$z^2 + 10z = -8u + 2C$$

$$(y-u)^2 + 10(y-u) = -8u + c'$$

$$(y-u)^2 + 10(y-u) + 8u = c'$$

$$\boxed{y - u^2 + 10y - 2u = c'}$$

QUESTION : 02

Solve initial value problem

$$(2xy-3)\,dx + (x^2+4y)\,dy = 0 \qquad y(1) = 2$$

$$M = 2xy - 3 \qquad N = x^2 + 4y$$

$$\frac{\partial M}{\partial y} = 2x \qquad \frac{\partial N}{\partial x} = 2x$$

$$\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$$

∴ The given equation is Exact

$$\frac{\partial f}{\partial x} = 2xy - 3 \quad \text{—— (1)}$$

$$\frac{\partial f}{\partial y} = x^2 + 4y \quad \text{— (2)}$$

Integrate (1) w.r.t x

$$f(x,y) = \frac{2x^2}{2}y - 3x + h(y)$$

$$\frac{\partial f}{\partial y} = x^2 + h'(y)$$

$$x^2 + 4y = x^2 + h'(y)$$

$$4y = h(y)$$

- integrate

$$\frac{4y^2}{2} = h(y)$$

$$2y^2 = h(y)$$

$$f(x,y) = x^2y - 3x + 2y^2 + c$$

$$y(1) = 2$$

$$x = 1 \quad , \quad y = 2$$

Putting x and y.

$$2 - 3 + 8 = c$$

$$c = 7$$

$$\boxed{x^2y - 3x + 2y^2 = 7.}$$

QUESTION : 03

solve

$$\frac{dy}{dx} + \left(\frac{3}{x}\right) y = 6x^2$$

$$\frac{dy}{dx} + \left(\frac{3}{x}\right) y = 6x^2 \quad \text{---} (1)$$

$$I.F = e^{\int 3/x \, dx} = e^{3 \ln x}$$

$$= e^{\ln x^3} = x^3$$

'Multiply' eq (1) by x^3

$$x^3 \frac{dy}{dx} + x^3 \frac{3y}{x} = 6x^2 x^3$$

$$x^3 \frac{dy}{dx} + 3x^2 y = 6x^5$$

$$\frac{d}{dx}(x^3 y) = 6x^5$$

By Integrating :-

$$x^3 y = \frac{6x^6}{6} + c$$

$$\boxed{x^3 y = x^6 + c}$$