

DIFFERENTIAL EQUATION {BSCS-3rd(M)}

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-: Objective :-

1- A

2- C

3- C

4- AA

5- A

6- C

7- B

8- B

9- D

10- C

11- B

12- A

∴ Subjective :-

QUESTION : 01

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

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

$$\text{Put } y-x = z \text{ in (1)}$$

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

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

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

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

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

$$= -4/z+5$$

By Applying Integration:

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

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

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

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

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

$$y^2 - u^2 + 10y - 2u = C'$$

QUESTION : 02

Solve initial value problem

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

$$M = 2xy - 3$$

$$N = x^2 + 4y$$

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

$$\frac{\partial N}{\partial x} = 2x$$

$$\frac{\partial M}{\partial y}$$

$$\frac{\partial N}{\partial x}$$

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

\therefore 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

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

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

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

$$y(1) = 2$$

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

Putting u and y .

$$2 - 3 + 8 = c$$

$$c = 7$$

$$u^2y - 3u + 2y^2 = 7$$

QUESTION : 03

Solve

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

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

$$\begin{aligned} \text{I.F} &= e^{\int \frac{3}{u} du} = e^{3 \ln u} \\ &= e^{\ln u^3} = u^3 \end{aligned}$$

Multiply eq (1) by u^3

$$u^3 \frac{dy}{du} + u^3 \frac{3y}{u} = 6u^2 \cdot u^3$$

$$u^3 \frac{dy}{du} + 3u^2 y = 6u^5$$

$$\frac{d}{du} (u^3 y) = 6u^5$$

By integrating ..

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

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