UG Odd Semester (CBCS) Examination, 2022 held in March 2023

PHARMACEUTICAL SCIENCES

(1st Semester)

Course No: BP 106RMT

(Remedial Mathematics - Theory)

Full Marks: 35

Time: 1.5 Hours

The figures in the margin indicate full marks for the questions

I . Long Answers (Answer 1 out of 2 Questions) 10x1=10

1. (a) Find the derivative of $sinx$ by using first principle method. 3

   (b) Evaluate $\int (x + 2)e^x \, dx$. 2

   (c) Let

$$A = \begin{pmatrix} -a^2 & ab & ac \\ ba & -b^2 & bc \\ ca & cb & -c^2 \end{pmatrix}$$

   Prove that $det(A) = 4a^2 b^2 c^2$. 5

2. (a) Find the value of p for which the points $(p, -1)$, (2, 1), and (4, 5) are collinear. 2

   (b) Discuss the continuity of the function 3

$$f(x) = \begin{cases} \dfrac{|x-3|}{x-3}, & If\ x \neq 3 \\ 0, & If\ x = 3 \end{cases}$$

   at the point $x = 3$.

(c) Solve the given differential equation 5

$$(x^2 - xy - y^2)\,dx + (\tfrac{1}{2}x^2 - 2xy)\,dy = 0.$$

II. Short Answers (Answer 5 out of 7 Questions) 5x5=25

1. Resolve the following expression into partial fractions 5

$$\frac{4x^3 + 16x + 7}{(x^2+4)^2}$$

2. (a) Use L'Hospital's rule to evaluate the following limit 3

$$\lim_{x \to -\infty} \frac{x^2}{e^{1-x}}$$

(b) Find whether the following differential equation is exact or not. 2

$$(\boldsymbol{2xy - \sin x})\boldsymbol{dx} + (\boldsymbol{x^2 - \cos y})\,\boldsymbol{dy} = \boldsymbol{0}.$$

3. Solve the system of equation by Cramer's rule. 5

$$2x + y - z = 0$$
$$x - y + z = 0$$
$$x + 2y + z = 3$$

4. (a) A ball is thrown in the air. Its height (h in meters), at any time t seconds is given by $h = 5t\,(4 - t)$. What is the maximum height reached by the ball? 3

(b) Show that the lines $2x+3y+5=0$ and $3x-2y+1=0$ are perpendicular to each other. 2

5. (a) Find the differential equation of the family of curves 2.5

$$y = Ae^{2x} + Be^{-2x}$$

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(b) Evaluate $\int_{\pi/2}^{\pi} x \cos x\,dx$ 2.5

6. Show that the solution of the differential equation 5

$$\frac{dy}{dx} + y\tan x = e^{2x}\cos x$$

at $y(0) = 2$ is

$$y = \frac{1}{2}(e^{2x} + 3)\cos x$$

7. (a) Find the angle between the lines $y - \sqrt{3}x - 5 = 0$ and $\sqrt{3}y - x + 6 = 0$ 2

(b) Check whether

$$A = \begin{pmatrix} 1 & 2 \\ -3 & 5 \end{pmatrix}$$

is singular or not. If not singular, find the inverse of the matrix A.

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