# CHANCHAL COLLEGE

## ASSIGNMENT- 2021

## MATHEMATICS (HONOURS)

### Paper Code: IV-A

Full Marks-20 Time: Thirty minuits

Answer all the questions. Each question carries 2 marks.

1. Feasible region in the set of points which satisfy

   (a) The objective functions (b) Some the given constraints

   (c) All of the given constraints (d) None of these

2. A set of values of decision variables which satisfies the linear constraints and non-negativity conditions of a L.P.P. is called its

   (a) Unbounded solution (b) Optimum solution (c) Feasible solution (d) None

3. The maximum value of Z = 4x + 2y subject to the constraints 2x + 3y ≤ 18, x + y ≥ 10, x, y ≥ 0 is

   (a) 36 (b) 40 (c) 30 (d) None of these

4. Maximize Z = 3x + 5y, subject to x + 4y ≤ 24, 3x + y ≤ 21, x + y ≤ 9, x ≥ 0, y ≥ 0

(a) 20 at (1, 0) (b) 30 at (0, 6) (c) 37 at (4, 5) (d) 33 at (6, 3)

5. Integrating factor of $\frac{dr}{d\theta} = 500\theta^n - \frac{r}{\theta}$ a) $\theta$ b) $2\theta$, c) $3\theta$, d) $4\theta$

6. Integrating factor of $y\frac{dx}{dy} = -2x + 10y^3$ a) y b) y+1 c) y+3 d) none

7. The DE $\left(1+(y')^2\right)^3 = r^2\left(\frac{d^2y}{dx^2}\right)$ represents

Family of a) circle of radius "r" b) sphere of radius "r" c) ellipse d) parabola

8. The integrating factor of $x \log x \; dx/dy + y = 2\log x$
   a) logx b) log2x c) log3x d)log4x

9. The directional derivatives of $1/\mathbf{r}$ in the direction of $\mathbf{r}$ is

   (A) $\frac{1}{r^3}$ (B) $\frac{1}{r^2}$ (C) $\frac{1}{r}$ (D) None of these

10. The value of t for which **A** + t **B** is perpendicular to **C** where **A** = **i** + 2**j** + 3**k**, **B** = -**i** + 2**j** + **k** and **C** = 3**i** + **j** is (a) 5 (b) 4 (c) 12 (d) 0.

# Paper Code: III-B

Full Marks-80 Time: Three Hours Thirty Minutes

## Group-A

**(Marks 20)**

Answer any four questions. 5X4=20

1. Show that the vector $(\vec{\beta}-\frac{\vec{\alpha}.\vec{\beta}}{|\vec{\alpha}|^2}\vec{\alpha})$ is perpendicular to $\vec{\alpha}$.

2. If $\hat{e}_1$ and $\hat{e}_2$ be two unit vectors and $\theta$ be the angle between them, then show that $2Sin\frac{\theta}{2}=|\hat{e}_1-\hat{e}_2|$.

3. If $|2\vec{a}+3\vec{b}|=|2\vec{a}-3\vec{b}|$, then prove that the vectors $\vec{a}$ and $\vec{b}$ are orthogonal.

4. If $\vec{a},\vec{b},\vec{c}$ represents three vectors determined by the sides of a triangle ABC taken in order, prove that $|\vec{a}\times\vec{b}|=|\vec{b}\times\vec{c}|=|\vec{c}\times\vec{a}|$. Hence show that $(\vec{a}-\vec{b})\times(\vec{a}+\vec{b})=2(\vec{a}\times\vec{b})$.

5. If $\vec{\alpha}\times\vec{\beta}+\vec{\beta}\times\vec{\gamma}+\vec{\gamma}\times\vec{\alpha}=\vec{0}$, then show that $\vec{\alpha},\vec{\beta},\vec{\gamma}$ are coplanar.

6. Show that $|\vec{\alpha}\times\vec{\beta}|^2|\vec{\alpha}\times\vec{\gamma}|^2-\{(\vec{\alpha}\times\vec{\beta}).(\vec{\alpha}\times\vec{\gamma})\}^2=|\vec{\alpha}|^2[\vec{\alpha}\vec{\beta}\vec{\gamma}]^2$.

## Group-B

**(Marks 30)**

Answer any four questions. 5X5=25

7. Show that if M(x, y)dx +N(x, y)dy=0, is both homogeneous and exact, and Mx+Ny is not a constant, then its general solution is given by Mx+Ny=c.

8. If $y_1$ & $y_2$ be solutions of the differential equation $\frac{dy}{dx}+Py=Q$, where P & Q are functions of x alone and $y_2=y_1z$, then $z=1+ae^{-\int y_1 Q\,dx}$, 'a' being an arbitrary constant. If you think this is true write 1 otherwise write 0.

9. Solve $y''-y=e^x$ by undetermined coefficients and by variation of parameters.

10. Using the variation of parameter method solve $\frac{d^2y}{dx^2}-3\frac{dy}{dx}+2y=\frac{e^x}{1+e^x}$.

11. Show that the system of co-axial parabolas $y^2 = 4a(x + a)$ is self orthogonal.

12. Find the eigen values and eigen functions of $\frac{d}{dx}\left(x.\frac{dy}{dx}\right) + y.\frac{\beta}{x} = 0,\quad (\beta > 0)$ satisfying the boubdary conditions $y(1) = 0,\ y(e^{\pi}) = 0.$

13. Find the complete integral of the equation by Charpit"s method

$$p^2x + q^2y = z,\ \ whwew\ p = \frac{\partial z}{\partial x}, q = \frac{\partial z}{\partial y}.$$

14. Solve: $\frac{dx}{dt} + 2x - 3y = t,\ \frac{dy}{dt} - 3x + 2y = e^{2t}.$

15. Solve the differential equation $y = x - 2ap + ap^2$. Find the singular solution and interpret it geometrically.

**Group-C**

**(Marks 30)**

Answer any five questions. 7X5=35

16. Solve graphically the linear programming problem : Maximize $z = 3x_1 + 4x_2$
Subject to $4x_1 + 2x_2 \le 80$ ; $2x_1 + 5x_2 \le 180$ ; $x_1, x_2 > 0$ .

17. Obtain the dual problem of the following L.P.P.
**Maximize :** $z = x_1 - 2x_2 + 3x_3$
Subject to : $-2x_1 + x_2 + 3x_3 = 2$
$2x_1 + 3x_2 + 4x_3 = 1$
$x_1, x_2, x_3 \ge 0.$

18. Use simplex method to solve the following L.P.P.
Maximize : $y = 7x_1 + 5x_2$
Subject to $x_1 + 2x_2 \le= 6$ ; $4x_1 + 3x_2 \le 12$ ; $x_1, x_2 \ge 0$ .

19. Solve the following Transportation problem

| | A | B | C | Available |
|---|---|---|---|---|
| I | 50 | 30 | 220 | 1 |
| II | 90 | 45 | 170 | 3 |
| III | 250 | 200 | 150 | 4 |
| Requirement | 4 | 2 | 2 | |

20. Solve the following assignment problem

| | W | X | Y | Z |
|---|---|---|---|---|
| A | 18 | 24 | 28 | 32 |
| B | 8 | 13 | 17 | 19 |
| C | 10 | 15 | 19 | 22 |

21. Solve the following 5 × 2 game graphically :

| | | Player B | |
|---|---|---|---|
| | | $B_1$ | $B_2$ |
| | $A_1$ | –2 | 5 |
| | $A_2$ | –5 | 3 |
| Player A | $A_3$ | 0 | –2 |
| | $A_4$ | –3 | 0 |
| | $A_5$ | 1 | –4 |