UG Odd Semester Examination, 2022

EDUCATION B.Sc. B.Ed
(5th Semester)

Course No.: BSMP-502
(Co-ordinate Geometry and L.P.P.)

Full Marks: 70
Pass Marks: 28

Time: 3 hours

The figures in the right margin indicate full marks for the question.
Answer the following five (5) questions

1. (a) If by a rotation of co-ordinate axes the expression ax+by and cx+dy are changed into $a'x' + b'y'$ and $c'x'+d'y'$ respectively, show that $a'd'-b'e' = ad-bc$. 7

(b) Show that the triangle formed by the striaght lines $ax^2 + 24xy + by^2 = 0$, and the straight line $lx + my = 1$, is right-angled if (a+b) (a+b) $(al^2+2hlm+bm^2) = 0$. 7

Or

2. (a) Show that the area of the traingle formed by the lines $ax^2+2hxy+by^2 = 0$ and $lx+my+n=0$ is $\dfrac{n^2\sqrt{h^2-ab}}{am^2-2hlm+bl^2}$ 7

(b) Reduce the equation

$4x^2-4xy+y^2-8x-6y+5=0$, to its canonical form and show that it represents a parabola. 7

3. (a) Prove that the sum of the reciprocals of two perpendicular focal chords of a conic is constant. 7

(b) Prove that the locus of the poles of normal chord of the rectangular hyperbola $ny=c^2$, is $(x^2-y^2)^2+4c^2xy=0$. 7

Or

4. (a) Prove that the locus of the poles of the normal chords of the hyperbola

$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$, is the curve

$a^6y^2 - b^6x^2 = (a^2+b^2)x^2y^2$. 7

(b) Tangents are drawn to the parabola $y^2=4ax$, at the points whose abscissae, are in the ratio P:1. Show that the locus of their point of intersection is a parabola. 7

5. (a) Find the shortest distance between the x-axis and the straight line $\frac{x-a}{l} = \frac{y-b}{m} = \frac{z}{n}$;

$a, b \neq 0$. 7

(b) Find the equation of the sphere for which the circle $x^2+y^2+z^2+2x-4y+5=0$, $x-2y+3z+1=0$ is a great circle. 7

Or

Show further that the dual of the dual is the primal.

(b) Find the basic feasible solution of the transportation problem by North-West-Corner rule. 7

	D_1	D_2	D_3	D_4	a_i
O1	19	20	50	10	7
O2	70	30	40	60	9
O3	40	8	70	20	18
b_j	5	8	7	14	

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these substances at a profit of Rs.15 per ton and 1:2:1 mixtures at a profit of Rs. 12 per ton respectively. Pose a linear programming problem to show hold many tons of these two mixtures should be prepared to obtain the maximum profit. 7

9. (a) Find the optimal solution of the transportation problem : 7

	D_1	D_2	D_3	D_4	a_i
O1	1	2	1	4	30
O2	3	3	2	1	50
O3	4	2	5	9	20
b_j	20	40	30	10	

(b) Find the optimal assignment for a problem with the following cost matrix : 7

	J_1	J_2	J_3
P_1	12	24	15
P_2	23	18	24
P_3	30	14	28

Or

10. (a) Find the dual of the L.P.P. 5+2=7

Max $z = 3x_1 + 4x_2$

Subject to $x_1+x_2 < 12$

$2x_1+3x_2 < 19$

$x_1 < 8$

$x_1, x_2 > 0.$

6. (a) Prove that the centres of spheres which touch the lines $y=mx,\ z=c;\ y=-mx,\ z=-c;$ lie on $maxy+cz(1+m^2)=0$.

(b) Prove that the plane $ax+by+cz=0$, cuts the cone $yz+zx+ny=0$, in two perpendicular lines if

$$\frac{1}{a} + \frac{1}{b} + \frac{1}{c} = 0.$$ 7

7. (a) Show that the problem : 7

Max $z = 6x_1 + 10x_2$

Subject to $3x_1+5x_2<10,$

$5x_1+3x_2<15$

$x_1, x_2>0$

has infinite number of optimal solutions.

(b) Find the basic feasible solutions of the system of equations. 7

$x_1 + x_2 + x_3 = 8,$
$3x_1 + 2x_2 + 18$
$x_1, x_2, x_3 > 0$

Or

8. (a) (2,1,3) is a feasible solution of the set of equations. 7

$4x_1+2x_2-3x_3=1,$

$6x_1+4x_2-5x_3=1$

Reduce it to basic feasible solution of the set.

(b) An agricultural farm has 180 tons of nitrogen fertilizers, 250 tons of phosphate and 220 tons of potash. It is able to sell 3:3:4 mixtures of