Sr. No. 200

Exam Code: 103203

Subject Code: 8862

B.A./B.Sc. - 3rd Sem. (Old Syllabus 2015)

(2118)

Paper: Mathematics Paper-II

(Co-ordinate & Solid Geometry)

Time allowed: 3 hrs. Max. Marks: 50

Note: Attempt Five questions in all, selecting at least Two questions from each section.

Section-A

1\. a) If by rotating the axes through an angle θ, the expression $ax^2+2hxy+by^2$ transforms to $Ax'^2+2Hx'y'+By'^2$, show that $a+b=A+B$ and $ab-h^2=AB-H^2$.

b) Find the angle through which the axes be rotated so that the equation $3x^2+2xy+3y^2-1=0$ is transformed into $4x^2+2y^2-1=0$. (5)

2\. a) Indentify the conic represent by the equation

$$9x^2+24xy+16y^2-2x+14y+1=0$$

and trnasform it into another equation of the same degree without xy term. (4)

b) Prove that the pair of lines $a^2x^2+2h(a+b)xy+b^2y^2=0$ is equally inclined to the pair of lines $ax^2+2hxy+by^2=0$. Find k so that $x^2+5xy+4y^2+3x+2y+k=0$ may represent a pair of straight lines. (5)

3\. a) Show that the tangents at the extremities of a focal chord of parabola intersect at right angles on the directrix. (5)

b) In the conic $3x^2+4y^2=5$, find the equation of the diameter which is conjugate to $3x+y=0$. (5)

4\. a) Find the equation to the parabola whose focus at the point (1,-1) and whose vertex is the point (2,1). (5)

b) Find the lengths of the axes, centre, eccentricity and co-ordinates of the foci of the conic $4x^2+9y^2-8x+36y+4=0$. (5)

5\. a) Show that the portion of the tangent at any point of an ellipse intercepted between the point of contact and the directrix subtends a right angle at the vertex. (5)

b) Show that the locus of the poles with respect to the parabola $y^2=4ax$ of the tangents to the hyperabola $x^2-y^2=a^2$ is the ellipse $4x^2+y^2=4a^2$.

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Section-B

6. a) Prove that the planes x=cy+bz, y=az+cx, z=bx+ay pass through one line if $a^2+b^2+c^2+2abc=1$ and show that the line of intersection, then is $\frac{x}{\sqrt{(1-a^2)}}=\frac{y}{\sqrt{(1-b^2)}}=\frac{z}{\sqrt{(1-c^2)}}$ (6)

b) Show that the following set of planes
x-z-1=0, x+y-2z-3=0, x-2y+z-3=0
form a triangular prism. (4)

7. a) Find the equation of the plane 2x+y+3z=5, referred to parallel axes through the point (1,-2,3) (2)

b) Find the equation of the surface $3x^2+5y^2+3z^2+2yz+2zx+2xy=1$ referred to the axes through the same origin with direction ratios -1,0,1; 1,-1,1; 1,2,1. (4)

c) Obtain the equation of the sphere described on the join of the points (2,-3,4), (-5,6,-7) as diameter. (4)

8. a) Obtain the sphere having its centre on the line 5y+2z=0, 2x-3y=0 and passing through (0,-2,-4), (2,-1,-1). (4)

b) Obtain the equation of the circle lying on the sphere $x^2+y^2+z^2-2x+4y-6z+3=0$ and having its centre at (2,3,-4) (4)

c) Show that the following set of points are concyclic:
(5,0,2), (2,-6,0), (7,-3,8), (4,-9,6) (2)

9. a) Obtain the equation of the sphere which passes through the circle $x^2+y^2=4$, z=0 and is cut by the plane x+2y+2z=0 in a circle of radius 3. (5)

b) Find the co-ordinates of the points where the line
$\frac{x+3}{4}=\frac{y+4}{3}=\frac{8-z}{5}$
intersect the sphere $x^2+y^2+z^2+2x-10y=23$. (5)

10. a) Find the equation of the sphere which touches the sphere $x^2+y^2+z^2-x+3y+2z-3=0$ at the point (1,1,-1) and pass through the origin. (4)

b) Show that any point on radical line has constant power with respect to the three given spheres. (3)

c) Show that power of a point (α,β,γ) with respect to sphere $x^2+y^2+z^2+24x+2\vartheta y+2wz+d=0$ is $\alpha^2+\beta^2+\gamma^2+2u\alpha+2\vartheta\beta+2w\gamma+d$. (3)

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