P.R.GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
I B.Sc. – MATHEMATICS - SEMESTER II (w.e.f. 2017-2018)

Course: SOLID GEOMETRY

Total Hrs. of Teaching-Learning: 90 @ 6 h / Week **Total Credits: 05**

Objective:

- To get awareness about the three dimensional geometry along with visualization.
- To be able to apply 3-D geometry for the construction.

Unit I: The Plane **(18 h)**

Equation of plane in terms of its intercepts on the axes, Equation of the plane through the given points, Length of the perpendicular from a given point to a given plane, Bisectors of angles between two planes, Combined equation of two planes, Orthogonal projection on a plane.

Unit II: The Straight Line **(18 h)**

Equation of a line, Angle between a line and a plane, the condition that a given line may lie in a given plane, the condition that the given lines are coplanar, Number of arbitrary constants in the equations of straight line, sets of conditions which determine a line, The shortest distance between two lines, the length and equations of the line of shortest distance between two straight lines, length of the perpendicular from a given point to a given line.

Unit III: The Sphere **(18h)**

Equation of the sphere, Plane section of a sphere, Intersection of two spheres, Equation of a circle, Sphere through a given circle, Intersection of a sphere and a line, Tangent lines and tangent planes, Plane of contact, Polar plane, conjugate points, Conjugate planes.

Unit IV: The Sphere and the Cone **(18h)**

Angle of intersection of two spheres, Condition for two spheres to be orthogonal, Radical plane, Coaxial system of spheres, Simplified form of the equation of two spheres.

Definition of a cone, Vertex, Guiding curve, generators, Equation of the cone with a given vertex and guiding curve, Equation of cone with vertex at origin is homogeneous, Condition that the general equation of the second degree should represent a cone.

Unit V: The Cone **(18 h)**

Enveloping cone of a sphere, Right Circular Cone, Conditions that a cone may have three mutually perpendicular generators, Intersection of a line and quadric cone, Tangent lines and tangent plane at a point, Condition that a plane may touch a cone, Reciprocal cones, Intersection of two cones with a common vertex.

Additional Inputs:

1. Intersection of three planes, Triangular prism.
2. The right circular cylinder.

Prescribed Book:

Scope as in "A text book of Mathematics for B.Sc. volume I" by V. Krishna Murthy & others, S.Chand and Company Ltd.

Reference Books:

1. Analytical Solid Geometry by Shanti Narayan and P. K. Mittal, Published by S. Chand & Company Ltd., Seventh Edition.
2. A text book of Analytical Geometry of Three Dimensions by P. K. Jain and Khaleel Ahmed, Wiley Eastern Ltd., 1999.
3. Course on Solid Geometry by N. P. Bali - Golden series publications.

BLUE PRINT FOR QUESTION PAPER PATTERN
SEMESTER-II

Unit	TOPIC	V.S.A.Q	S.A.Q	E.Q	Marks allotted to the Unit
I	The Plane	1	1	2	22
II	The Right Line	1	1	2	22
III	The Sphere	1	1	1	14
IV	The Sphere & The Cone	1	1	2	22
V	The Cone	1	1	1	14
TOTAL		5	5	8	94

V. S. A. Q. = Very short answer questions (1 mark)
S. A. Q. = Short answer questions (5 marks)
E.Q. = Essay questions (8 marks)

Very short answer questions : 5 X 1 = 05
Short answer questions : 3 X 5 = 15
Essay questions : 5 X 8 = 40

Total Marks = 60

P.R. Government College (Autonomous), Kakinada
I year B.Sc., Degree Examinations - II Semester
Mathematics Course: Solid Geometry
Paper II (Model Paper w.e.f. 2017 - 2018)

Time: 2Hrs 30 min | Max. Marks: 60

PART-I

Answer ALL the questions. Each question carries 1 mark. 5 X 1 = 5 M

1. Find the equation of the plane through the line of intersection of $x - 3y + 2z + 3 = 0$, $3x - y - 2z - 5 = 0$ and the origin.
2. Find the equation of the line passing through $(4, 3, -7)$ and equally inclined to the axes.
3. Find the centre of the sphere $x^2 + y^2 + z^2 - 3x + 5y - 4z - 3 = 0$.
4. Find the polar plane of the point (0, -1, 1) with respect to the sphere $x^2 + y^2 + z^2 - 2x + 4y + 6z - 11 = 0$.
5. Write the reciprocal cone of $9x^2 + 4y^2 - 7z^2 = 0$.

PART –II

Answer any THREE questions. Each question carries 5 marks. 3 X 5 = 15 M

6. Find the equation of the plane through the point (-1, 3, 2) and perpendicular to the two planes $x + 2y + 2z = 5$ and $3x + 3y + 2z = 8$.
7. Find the image of the point $A(1,3,4)$ in the plane $2x - y + z + 3 = 0$.
8. Find the equation of the sphere through the origin and making intercepts a, b, c with the axes.
9. If r_1 and r_2 are the radii of the orthogonal spheres, then find the radius of the circle of their intersection.
10. Find the equation of the enveloping cone of the sphere $x^2 + y^2 + z^2 + 2x - 2y = 2$, with its vertex at (1, 1, 1).

PART-III

Answer any FIVE questions from the following by choosing at least TWO from each section. Each question carries 8 marks. 5 X 8 = 40 M

SECTION -A

11. Find the planes bisecting the angles between the planes $2x - y + 2z + 3 = 0$ and $3x - 2y + 6z + 8 = 0$. Point out which of the planes bisects the acute angle and which bisects the obtuse angle in which the origin lies.
12. Show that the equation $x^2 + 4y^2 + 9z^2 - 12yz - 6zx + 4xy + 5x + 10y - 15z + 6 = 0$ represents a pair of parallel planes and find the distance between them.
13. Prove that the lines $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$; $\frac{x-2}{3} = \frac{y-3}{4} = \frac{z-4}{5}$ are coplanar. Also find their point of intersection and the plane containing the lines.
14. Find the length and equations of the line of shortest distance between the lines $\frac{x-2}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and $\frac{x-2}{3} = \frac{y-4}{4} = \frac{z-5}{5}$.

SECTION –B

15. Show that the four points (-8, 5, 2), (-5, 2, 2), (-7, 6, 6), (-4, 3, 6) are concyclic.
16. Find the equation of the sphere which touches the plane $3x + 2y - z + 2 = 0$ at $(1, -2, 1)$ and cuts orthogonally the sphere $x^2 + y^2 + z^2 - 4x + 6y + 4 = 0$.
17. Prove that the plane $ax + by + cz = 0$ cuts the cone $yz + zx + xy = 0$ in a perpendicular lines if $\frac{1}{a} + \frac{1}{b} + \frac{1}{c} = 0$.
18. Find the equation to the right circular cone whose vertex in $P(2, -3, 5)$ axis PQ which makes equal angles with the axis and which passes through (1, -2, 3).

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