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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 1: 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.

Nov II
III

Unit 2: 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.

Nov IV
Dec I week

Unit 3: 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.

Dec I, II
IV, V

Unit 4: 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.

Jan I, II

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.

(18 h)

Unit 5: The Cone

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.

Feb I, II

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 Co. .ltd.

ReferenceBooks:

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
1	The Plane	1	1	2	22
2	The Right Line	1	1	2	22
3	The Sphere	1	1	1	14
4	The Sphere & The Cone	1	1	2	22
5	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 : $5 \times 1 = 05$

Short answer questions : $3 \times 5 = 15$

Essay questions : $5 \times 8 = 40$

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Total Marks = 60
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P.R.Government College (Autonomous), Kakinada
1 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 1M = 5 M

- 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.
- Find the equation of the line passing through $(4, 3, -7)$ and equally inclined to the axes.
- Find the centre of the sphere $x^2 + y^2 + z^2 - 3x + 5y - 4z - 3 = 0$.
- Find the polar plane of the point $(0, -1, 1)$ with respect to the sphere $x^2 + y^2 + z^2 - 2x + 4y + 6z - 11 = 0$.
- 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 5M = 15 M

- Find the equation of the plane through the point $(-1, 3, 2)$ and perpendicular to the two planes $x + 2y + 2z = 5$ and $3x + 3y + 2z = 8$.
- Find the image of the point $A(1, 3, 4)$ in the plane $2x - y + z + 3 = 0$.
- Find the equation of the sphere through the origin and making intercepts a, b, c with the axes.
- If r_1 and r_2 are the radii of the orthogonal spheres, then find the radius of the circle of their intersection.
- 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 8M = 40M

SECTION -A

- Find the planes bisecting the angles between 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.
- 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.
- 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 shortest distance between the lines

$$\frac{x-2}{2} = \frac{y-2}{3} = \frac{z-3}{4} \text{ and } \frac{x-2}{3} = \frac{y-4}{4} = \frac{z-5}{5}.$$

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 circles cone whose vertex in $P(2, -3, 5)$ axis PQ which makes equal angles with the axis and which passes through $(1, -2, 3)$.
