**Roll No……..** **Total No. of Printed Pages: [01]**

**Total No. of Questions: [09]**

**B.Sc. (Hons.) Mathematics (Semester –3rd)**

**ANALYTICAL GEOMETRY**

**Subject Code: BMATS1324**

**Paper ID: [22131213]**

**Time: 03 Hours** **Maximum Marks: 60**

**Instruction for candidates:**

1. Section A is compulsory. It consists of 10 parts of two marks each.
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

**Section – A** **(2 marks each)**

Q1. Attempt the following:

a) Transform to parallel axes through the point (1,-3) the equation $2x^2+y^2-4x+4y=0$

b) Show that planes $2x + 8y + 2z = 1,\ 4x - 2y - 5z = 2\ and\ 5x + 2y - 4z = -2\ form\ a$ triangular prism.

c) Find the equation of the cone whose vertex is at the origin and which intersects the curve $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1,\ z = c.$

d) What is the standard form of right circular cone?

e) Find the general equation of cone of the second degree which passes through the axes.

f) Prove that section of a right circular cylinder by any plane perpendicular to its axis is a circle.

g) Discuss special types of cylinders.

h) Find the angle of intersection of the spheres of the spheres $x^2 + y^2 + z^2 = 4$ and $x^2 + y^2 + z^2 = 2x + 2y.$

i) Find the equation of the sphere which passes through (1,-1,2) and whose centre is (-1,2,3).

j) Prove that centres of a coaxial system of spheres are collinear.

**Section – B** **(5 marks each)**

Q2. Eliminate the mixed terms in $8(x - y + z)^2 - 9(x + y)^2 - 4(x - y - 2z)^2 + 13 = 0$ by suitable rotation of axes. Also find the direction cosines of new axes.

Q3. Find the equation of the enveloping cone from the point $(x_1, y_1, z_1)$ to the sphere $x^2 + y^2 + z^2 = a^2$

Q4. Find the equation of right circular cylinder whose axis is $\frac{x-2}{2} = \frac{y-1}{1} = \frac{z}{3}$ and passes through point $(0, 0, 3)$.

Q5. Find the equation of the sphere which passes through the points (1,0,0), (0,1,0) and (0,0,1) and has its radius as small as possible.

Q6. Show that the spheres $x^2 + y^2 + z^2 = 25$ and $x^2 + y^2 + z^2 - 24x - 40y - 18z + 225 = 0$ touch externally and find the point of contact.

**Section – C** **(10 marks each)**

Q7. Prove that $\sqrt{fx} + \sqrt{gy} + \sqrt{hz} = 0$ represents a cone which touches the coordinates planes and also find the equation of the reciprocal cone.

Q8. Find the equation of the enveloping cylinder of the sphere $x^2 + y^2 + z^2 = a^2$, whose generators are parallel to the line $\frac{x}{l} = \frac{y}{m} = \frac{z}{n}$.

Q9. Prove that the planes $x = cy + bz$, $y = az + cx$, $z = bx + ay$ pass through the line if $a^2 + b^2 + c^2 + 2abc = 1$. Also find line of intersection.