Seat No:_____ Enrollment No:_____

# PARUL UNIVERSITY

## FACULTY OF APPLIED SCIENCE

## B.Sc./IMSC, Winter 2017-18 Examination

**Semester: 3** **Date: 19/12/2017**
**Subject Code: 11106201** **Time: 10:30 am to 1:00 pm**
**Subject Name: Solid Geometry** **Total Marks: 60**

**Instructions:**
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

**Q.1. A) Do as directed (Each of 04 marks)** **(08)**

(a) Find the equation of the sphere through the circle $x^2 + y^2 + z^2 = 1,\ 2x + 4y + 5z = 6$ and touching the plane $z = 0$.

(b) Show that the points (0,7,10), (-1,6,6),(-4,9,6) form isosceles right angled triangle.

**Q.1. B) Answer the following questions. (Any two)**

(a) Do as directed (Each of 02 marks) **(04)**

1. Find the co-ordinates of the point P which divides the line segment joining A (2,3,1) and B (-2,7,5) in 1:3.
2. Find the equation of the plane which is perpendicular to the planes $x - y + z = 1$ and $2x + y + z = 1$ and passes through (1,1,1).

(b) Find the equation of the cone whose vertex is $(\alpha, \beta, \gamma)$ and the base curve is $y^2 = 4ax,\ z = 0.$ **(04)**

(c) Find the equation to the right angle circular cone whose vertex is P (2,-3,5) axis PQ which makes equal angles with the axes and semi-vertical angle is $30°$. **(04)**

**Q.2. A) Answer the following questions.**

(a) Do as directed (Each of 02 marks) **(04)**

1. Obtain the equation of the plane through the intersection of the planes $x + 2y + 3z + 4 = 0$ and $4x + 3y + 2z + 1 = 0$ and the origin.
2. Find the direction cosine of the line which is perpendicular to the lines with direction cosines proportional to (1,-2,-2), (0,2,1).

(b) Find the equation of the plane through the points (2,2,-1), (3,4,2), (7,0,6). **(04)**

**Q.2. B) Answer the following questions. (Any two)**

(a) Answer the following questions. (Each of 01 mark) **(03)**

1. Find the distance between the parallel planes $2x - 2y + z + 3 = 0$ and $4x - 4y + 2z + 9 = 0$
2. The plane $x + y = 1$ is parallel to _____ axis.
3. Is the statement, "The point *(x,y,z)* is in 2nd octant if *x>0, y>0* and *z<0*" true? Justify.

(b) Find the area of the triangle whose vertices are the points (1,2,3), (-2,1,-4), (3,4,-2). **(03)**

(c) Find the point where the line joining (2,-3,1), (3,-4,-5) cuts the plane $2x + y + z = 7$. **(03)**

**Q.3. A) Answer the following question (Each of 04 marks)** **(08)**

(a) Derive the equation of the sphere having centre at $(-u,-v,-w)$ and radius a. Also find the centre and radius of the circle $x^2 + y^2 + z^2 + 2x - 4y - 6z + 5 = 0$

(b) Find the equations of two tangent planes to the sphere $x^2 + y^2 + z^2 - 4x + 2y - 6z + 5 = 0$ which are parallel to the plane $2x + 2y = z$.

**Q.3. B) Answer the following questions (Any two)**

(a) Do as directed. (Each of 02 marks) **(04)**

1. Show that the lines $\frac{x-4}{1} = \frac{y+3}{-4} = \frac{z+1}{7};\ \frac{x-1}{2} = \frac{y+1}{-3} = \frac{z+10}{8}$ intersect and find the co-ordinates of the point of intersection.
2. Find the equation of plane which is perpendicular to the line $x = y = z - 1$ and passing through (1, -1, 2).

(b) Define Plane. Prove that the equation of the plane is $ax + by + cz + d = 0.$ **(04)**

(c) Find the equation of the sphere which touches the sphere **(04)**
$x^2 + y^2 + z^2 - x + 3y + 2z - 3 = 0$ at the point (1,1,-1) and passes through the origin.

**Q.4. A) Answer the following questions.**

(a) Do as directed. (Each of 02 marks) **(04)**

1. Find the equations of the line which passes through the point (2,-1,1) and intersect the lines $2x + y - 4 = 0 = y + 2z;\ x + 3z = 4, 2x + 5z = 8.$
2. Find the equation of line which passes through the point (3,-1,11) and perpendicular to the line $\frac{x}{2} = \frac{y-2}{3} = \frac{z-3}{4}$.

(b) Multiple choice questions. (Each of 01 mark) **(04)**

1. The equations to x-axis are
   (a) $\frac{x}{0} = \frac{y}{1} = \frac{z}{1}$ (b) $\frac{x}{1} = \frac{y}{0} = \frac{z}{1}$ (c) $\frac{x}{0} = \frac{y}{0} = \frac{z}{1}$ (d) $\frac{x}{1} = \frac{y}{0} = \frac{z}{0}$
2. The angle between the lines $x = 1, y = 2$ and $y = -1, z = 0$
   (a) 90° (b) 30° (c) 60° (d) 0°
3. The centroid of the tetrahedron whose vertices are (a,,0,0), (0,b,0), (0,0,c), (3a,3b,3c) is
   (a) $(a,b,c)$ (b) $\left(\frac{4a}{3}, \frac{4b}{3}, \frac{4c}{3}\right)$ (c) $(2a,2b,2c)$ (d) none
4. If $\alpha, \beta$ and $\gamma$ are angle made by line OP then $\sin^2\alpha + \sin^2\beta + \sin^2\gamma =$ _____
   (a) 3 (b) 0 (c) 1 (d) 2

**Q.4. B) Answer the following questions (Any two)**

(a) Multiple choice questions. (Each of 01 mark) **(03)**

1. If $l, m, n$ are direction cosine then $l^2 + m^2 + n^2 =$ ____
   (a) 1 (b) 0
   (c) 2 (d) We can not say
2. Two lines are perpendicular if
   (a) Product of their direction cosine is 1
   (b) Product of their direction cosine is 0
   (c) Product of their direction ration is -1
   (d) Product of their direction ration is 1
3. The equation of cylinder parallel to z- axis is
   (a) $x^2 + y^2 = a^2$
   (b) $x^2 + z^2 = a^2$
   (c) $z^2 + y^2 = a^2$
   (d) $x^2 + y^2 + z = a^2$.

(b) Put in symmetrical form, the equations of the line $3x - y + z + 1 = 0$, $5x + y + 3z = 0$. Also find the equation of line which is parallel to this line and passes through origin. **(03)**

(c) Show that the equation $4x^2 - y^2 + 2z^2 + 2xy - 3yz + 12x - 11y + 6z + 4 = 0$, represents a cone with vertex (-1,-2,-3). **(03)**