22MAU102N/22MAU102

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2024
(First Semester)

Branch – **MATHEMATICS**

ANALYTICAL GEOMETRY OF 3D AND TRIGONOMETRY

Time: Three Hours Maximum: 75 Marks

SECTION-A (10 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** marks (10 × 1 = 10)

Module No.	Question No.	Question	K Level	CO
1	1	The direction ratio for the straight line $\frac{x-3}{-1}=\frac{y-4}{2}=\frac{z+2}{1}$ is _____. a. (3,4,-2) b. (-3, -4, 2) c. (-1,2,1) d. (1,-2,-1)	K1	CO1
	2	The two lines are coplanar, they must be _____ a. Parallel b. intersect c. touches each other d. not intersect	K2	CO1
2	3	The centre of the sphere of $x^2+y^2+z^2-12x+2y-4z+16=0$ is_____ a. (-6, -1, 2) b. (6,1,2) c. (6,-1,2) d. (6,1,-2)	K1	CO2
	4	Equation of the tangent plane to the sphere $x^2+y^2+z^2=r^2$ at the point (x_1,y_1,z_1) is _____ a. $xx1+yy1+zz1=r^2$ b.$x1+y1+z1=r^2$ c. $x+y+z=r^2$ d. $xx1+yy1+zz1=0$	K2	CO2
3	5	The condition that the cone has three mutually perpendicular generators is _____ a. $\theta=45^\circ$ b. $\theta=180^\circ$ c. $\theta=90^\circ$ d. $\theta=60^\circ$	K1	CO3
	6	The general equation to a cone which touches the coordinate planes is _____ a. $f^2x^2+g^2y^2+h^2z^2$ =0 b. $f^2x^2+g^2y^2+h^2z^2$ =1 c. a. $f^2x^2+g^2y^2+h^2z^2-2ghyz-2hfzx-2fgxy$ =0 d. a. $f^2x^2+g^2y^2+h^2z^2+2ghyz+2hfzx+2fgxy$ =0	K2	CO3
4	7	Any plane which intersect the cylinder whose conic equation is of second degree is a _____ a. cylinder b. cone c. guiding curve d. right circular cylinder	K1	CO4
	8	The equation of the tangent plane at P(x1,y1,z1) is ___ a. $axx1+byy1+czz1=1$ b. $xx1+yy1+zz1=1$ c. $xx1+yy1+zz1=0$ d. $axx1+byy1+czz1=0$	K2	CO4
5	9	$cosh^2x-sinh^2x$ =_____ a. 1 b. 0 c. cosx d. sinx	K1	CO5
	10	Expansion of sin θ is _____. a. $\theta-\frac{\theta^3}{3!}+\frac{\theta^5}{5!}+\cdots$ b. $\theta+\frac{\theta^3}{3!}+\frac{\theta^5}{5!}+\cdots$ c. $1-\frac{\theta^3}{3!}+\frac{\theta^5}{5!}+\cdots$ d. $1+\frac{\theta^3}{3!}+\frac{\theta^5}{5!}+\cdots$	K2	CO5

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SECTION - B (35 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5 × 7 = 35)

Module No.	Question No.	Question	K Level	CO
1	11.a.	Find the perpendicular distance from P(3, 9, -1) to the line $\frac{x+8}{-8} = \frac{y-31}{1} = \frac{z-13}{5}$.	K2	CO1
		(OR)		
	11.b.	Prove that the lines are coplanar. $\frac{x+1}{-3} = \frac{y+10}{8} = \frac{z-1}{2}$; $\frac{x+3}{-4} = \frac{y+1}{7} = \frac{z-4}{1}$.		
2	12.a.	Find the coordinates of centre and radius of the sphere $2x^2 + 2y^2 + 2z^2 - 2x + 4y + 2z - 15 = 0$	K3	CO2
		(OR)		
	12.b.	Find the equation of the sphere having the circle $x^2 + y^2 + z^2 - 2x + 4y - 6z = 0$, $2x - y + 2z = 5$ for a great circle.		
3	13.a.	Show that the equation of a right circular cone whose vertex is O, axis OZ and semi vertical angle α is $x^2 + y^2 = z^2 tan\alpha$.	K3	CO3
		(OR)		
	13.b.	Find the equation of the tangent planes to the cone $9x^2 - 4y^2 + 16z^2 = 0$ which contain the line $\frac{x}{32} = \frac{y}{72} = \frac{z}{27}$.		
4	14.a.	Find the equation of a right circular cylinder of radius 3 with axis $\frac{x+2}{3} = \frac{y-4}{6} = \frac{z-1}{2}$.	K4	CO4
		(OR)		
	14.b.	Derive the condition for the plane lx+my+nz=p to touch the conicoid $ax^2 + by^2 + cz^2 = 1$.		
5	15.a.	Express $cos\,8\,\theta$ in terms of $sin\,\theta$.	K4	CO5
		(OR)		
	15.b.	Separate into real and imaginary parts tanh(1+i).		

SECTION -C (30 Marks)

Answer **ANY THREE** questions

ALL questions carry **EQUAL** Marks (3 × 10 = 30)

Module No.	Question No.	Question	K Level	CO
1	16	Find the shortest distance between the lines $\frac{x-3}{-1} = \frac{y-4}{2} = \frac{z+2}{1}$; $\frac{x-1}{1} = \frac{y+7}{3} = \frac{z+2}{2}$.	K2	CO1
2	17	Show that the plane 2x-y-2z=16 touches the sphere $x^2 + y^2 + z^2 - 4x + 2y + 2z - 3 = 0$ and find the point of contact.	K3	CO2
3	18	Find the condition for the equation $ax^2 + by^2 + cz^2 + 2fyz + 2gzx + 2fxyz = 0$ to represent the right circular cone. Obtain the equation of the axis and the vertical angle of the cone.	K3	CO3
4	19	Find the equations of the tangent planes to $x^2 + y^2 + 4z^2 = 1$ which intersect in the line whose equations are 12x-3y-5=0, z=1.	K4	CO4
5	20	Expand $sin^8\,\theta\ cos^5\,\theta$ in a series of sines of multiples of θ.	K4	CO5

Z-Z-Z END