UNIVERSITY OF THE PUNJAB

B.S. 4 Years Program / Second Semester – Spring 2022

Roll No. .....

Paper: Mathematics A -II, [Plane Curves & Analytic Geometry]
Course Code: MATH-103 / MTH-12309

Time: 3 Hrs. Marks: 60

THE ANSWERS MUST BE ATTEMPTED ON THE ANSWER SHEET PROVIDED

Q.1. Solve the following. (6x5=30)

(i) Find equation of normal to the curve $x(x^2+y^2)-ay^2=0$ *at* $x=\frac{a}{2}$.

(ii) Identify and graph the given polar equation $r=\frac{6}{1-2\sin\theta}$.

(iii) Find a and b so that the function f given by $f(x)=ax^3+bx^2$ has *(1,6)* as point of inflection.

(iv) Find the area of the region bounded by $y=lnx, x-axis, x=a, x=b$.

(v) Find an equation of the plane which passes through the point (3,4,5), has an x-intercept equal to -5 and is perpendicular to the plane $2x+3y-z=8$.

(vi) Prove that in a spherical triangle ABC, with a, b, c are lengths of the sides BC, CA, AB respectively

$$\frac{\sin\frac{A+B}{2}}{\cos\frac{C}{2}}=\frac{\cos\frac{a-b}{2}}{\cos\frac{c}{2}}.$$

Q.2. Solve the following. (3x10=30)

i. Prove that if P is any point on a hyperbola with foci F_1 and F_2, the tangent at P bisects the angle F_1PF_2.

ii. Find the radius of curvature of the curve $r=a(1+\cos\theta)$ at the point where the tangent is parallel to the initial line.

iii. Find the equation of the cone whose directrix is $y^2=x,\ z=4$ and whose vertex is at $A(0,2,0)$.