UNIVERSITY OF THE PUNJAB

B.S. 4 Years Program : Seventh Semester – Fall 2021

Roll No. .....

Paper: Theory of Approximation & Splines –I **Course Code: MATH-413** **Time: 3 Hrs. Marks: 60**

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

(i) Write the Lagrange interpolation formula for the following six data points: $\{(x_0, y_0), (x_1, y_1), (x_2, y_2), (x_3, y_3), (x_4, y_4), (x_5, y_5)\}$.

(ii) Discuss the 2D shear transformation.

(iii) Derive the formula for reflection of a point $P(x, y)$ about the line $y = x$.

(iv) Derive the formula for least square power fit.

(v) Find solution using Stirlings formula.

x	20	25	30	35	40
$f(x)$	49225	48316	47236	45926	44306

(vi) Write the formula of maximum error, average error and root-mean square error.

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

(i) Discuss the error term and error bound of Lagrange interpolation.

(ii) Find $f(x)$ as a polynomial in x for the following data by Newton's Divided difference formula:

x	1	3	4	5	7	10
$f(x)$	3	31	69	131	351	1011

Find the value of $f(x)$ at $x = 3$ and $x = 6$. Moreover, calculate $f'(x)$ at $x = 3.6$.

(iii) Fit the least square parabola $y = a + bx + cx^2$ to the following data:

x	1996	1997	1998	1999	2000
y	40	50	62	58	60