National University of Computer and Emerging Sciences, Lahore Campus				
	Course:	Numerical Computing	Course Code:	CS325
	Program:	BSCS	Semester:	Fall2020
	Duration:	90 minutes	Total Marks:	60
	Paper Date:	October 15; 2020	Weight	20%
	Section:	All	Page(s):	1
	Exam:	Sessional - I	Roll No:	[redacted]
Instruction/Notes:	Attempt All Questions.			

Q1. (a) Following is the data from the steam table. **Points (10)**

Temperature (C)	140	150	160	170	180
Pressure	3.685	4.854	6.302	8.076	10.225

Using suitable interpolation/extrapolation scheme for equally spaced data to find the pressure of the steam for a temperature of 138^oC.

Note: **(i)** Use all the given data points. **(ii)** Throughout the computations truncate values after three decimal places.
Hint: For selection of suitable scheme keep target temperature in mind.

(b) Apply Lagrange formula inversely to obtain the root of the equation $f(x) = 0$, given that $f(30) = -30, f(34) = -13$ **Points (10)**

Q2. The current $I(x)$ in a circuit is given by the table below: **Points (20)**

x	1.0	1.1	1.2	1.3
$I(x)$	8.2277	7.2428	5.9908	4.5260

Derive formula for numerical differentiation (1^{st} order) based on Gauss forward interpolation formula. Also evaluate $\acute{I}(1.25)$ using the obtained formula.

$$y_p = y_0 + p\,\Delta y_0 + \frac{p\,(p-1)}{2!}\Delta^2 y_{-1} + \frac{p\,(p-1)(p+1)}{3!}\Delta^3 y_{-1} + \frac{p\,(p-1)(p+1)\,(p-2)}{4!}\Delta^4 y_{-2} + \ \ldots$$

Q3. Approximate the integral $\int_{-2}^{2} xe^{x}\,dx$, using Composite Simpson's rule with $h = 2, 1$. Then use Romberg Integration based on Simpson rule to find $O(h^6)$ approximation. Moreover, solve the integral analytically (exactly) and compare the obtained results. Analyze the results and conclude you answer in two lines. **Points (20)**
Note: Throughout the problem values should be taken at least 6 decimals places.