EAST WEST UNIVERSITY

Semester Final Examination, Fall-2021
Department of Mathematics and Physical Sciences
Course Code: MAT 205 (Linear Algebra and Complex Variables)
Section: 8,   Time: 90 minutes,   Full Marks: 50
Course Instructor: Dr. Nepal Chandra Roy (DNCR)

N.B.: Answer all the questions. Figure in the right margin indicates the full marks of the corresponding question.

1. (a)   Find the LU factorization of   [5]

$$A = \begin{bmatrix} 1 & -3 & 5 \\ 2 & -4 & 7 \\ 1 & -2 & 1 \end{bmatrix}.$$

   (b)   Find the least square solution of the linear system **Ax=b** given by   [5]

$$2x_1 - 2x_2 = 2$$
$$x_1 - x_2 = -1$$
$$3x_1 + x_2 = 1$$

2. (a)   Evaluate $\oint\limits_{C} \dfrac{\sin \pi z^2 + \cos \pi z^2}{(z-1)(z-2)} dz$ where C is the circle $|z|=3$.   [5]

   (b)   Evaluate $\oint\limits_{C} \dfrac{e^z}{\left(z^2 + \pi^2\right)^2} dz$ where C is the circle $|z|=4$.   [5]

3. (a)   Expand $f(z) = \sin z$ in a Taylor series about $z=\pi/4$.   [5]

   (b)   Find Laurent series of $f(z) = \dfrac{1}{(z+1)(z+3)}$ valid for $1<|z|<3$.   [5]

4.   Evaluate the integral $\displaystyle\int_0^{2\pi} \dfrac{dx}{1+a\sin x}, \ 0 < a < 1$.   [10]

5.(a)   Evaluate $\displaystyle\int_{(0,3)}^{(2,4)} \left\{(2y+x^2)dx + (3x-y)dy\right\}$ along the straight line $x=2t$ and   [5]
   $y=t^2+3$.

   (b)   Evaluate $\displaystyle\int_C \bar{z}dz$ from $z=0$ to $z=4+2i$ along the curve C given by the line from   [5]
   $z=0$ to $z=2i$ and then the line $z=2i$ to $z=4+2i$.