AEM2(Class 15, Midterm Exam) 2021.10.25

Department:

Student Id Number:

Student Name:

1. Express $f(x)$ by the Fourier series

    where $f(x) = \begin{cases} -2, & -\pi < x \le 0 \\ 1 & 0 < x \le \pi \end{cases}$, $f(x) = f(x + 2\pi)$.

2. Express $f(x)$ by the Fourier series where $f(x) = |x\text{-}2|$ for $0 < x \le 4$,
    $f(x) = f(x+4)$.

3. Show that $f(x) = 3x^2\text{-}1$ and $g(x) = 35x^4\text{-}30x^2+3$ are orthogonal to each other on [-1, 1].

4. Express $f(x)$ by the Fourier integral where $f(x) = \begin{cases} -2, & -3 < x < 3 \\ 0 & otherwise. \end{cases}$

5. By integration find the Fourier transform of $f(x) = 2x+1$ if $|x| < 1$ and $f(x) = 0$ otherwise.

6. Find the DFT of [1, 2, 0].

7. Find answers in rectangular form.

(a) $2\angle\pi/6 + 4\angle 60^\circ =$

(b) $(2\angle\pi/3)/(4+i3) =$

(c) $(3-i4)/(4+i2)* =$

(d) $(2\angle 3\pi/4) \cdot 5\angle 60^\circ =$

8. Find the values of $z = \sqrt[5]{2+3i}$ **in rectangular form.**

9. Answer the follwing questions.

(a) Determine whether $f(z)=3z^2\text{-}zz*$ is differentiable.

(b) Let $f(z)$ be a complex function which is not constant. Is it possible for both $f(z)$ and $[f(z)]*$ to be analytic?

10. (a) Solve e^z **= 5-12i.**

(b) Solve sin$z$ = 10.

(c) Express Ln(5-12i) in rectangular form.

(d) Express principal value of (3-4i)$^{2+3i}$ in polar form.