

Example: Evaluation of “definite integral” in MATLAB

- `int(expr,var,a,b)`

- inbuilt function in MATLAB computes the definite integral of “**expr**” with respect to the symbolic scalar variable **var** from **a** to **b**.

- $F = \int_0^1 x \log(1+x) dx$

```
syms x
expr = x*log(1+x);
F = int(expr,[0 1]);
```

Output: $F = 1/4$

```
syms x
F = int(x*log(1+x),[0 1]);
```

Output: $F = 1/4$

- $F = \int_0^{10} \frac{\cos(t)}{\sqrt{1+t^2}} dt$

```
syms t
f = cos(t)/sqrt(1 + t^2);
Fint = int(f,t,0,10)
Fvpa = vpa(Fint)
```

Fvpa =

0.37570628299079723478493405557162

Task: Fourier analysis and synthesis

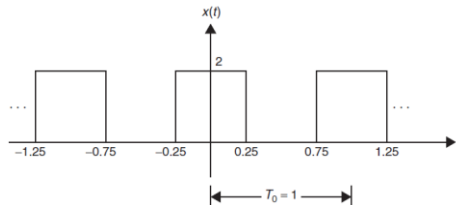
1. Write a MATLAB script to calculate the Fourier series coefficient of the following signals:

(a) $x(t) = \sin(100t)$

(d)

(b) $x(t) = 1 + \sin(100t)$

(c) $x(t) = \frac{1}{2}[1 - \cos(\pi t)]$



Hints: Calculate *fundamental period* (T) and then apply *integration* to obtain a_k

$$a_n = \frac{1}{T} \int_0^T x(t) e^{-jn\omega_0 t} dt$$

- (i) Plot the *magnitude and phase* of the Fourier series coefficient
- (ii) *Verify* the obtained result in (i) with analytical calculated value.

(consider k from -10 to 10)

Use MATLAB “`heaviside(t)`” inbuilt function for the symbolic define of $u(t)$ required in integration

2. Write a MATLAB script to reconstruct the signal in Question 1 with obtained Fourier-series coefficient using the relation,

$$x_N(t) = \sum_{k=-N}^N a_k e^{jk\left(\frac{2\pi}{T}\right)t}$$

- Then compare the original signal $x(t)$ with $x_N(t)$ for a set of value t
- Also calculate error signal $e(t) = x(t) - x_N(t)$

Structure of lab report

- a) Title of the experiment → “Creation a document using MS office”
- b) Your name → XYZ, Roll-no: 1234
- c) About the experiments →
- d) Content of the experiment (diagram/programme source code/flowchart) →
- e) Your observation/what you learned →

After complementation of the LAB, document has to be uploaded in Google classroom
filename: **StudentName_rollNo**

Thank you!