Write a Matlab program with GUI (graphical user interfaces) to solve (B-1) economic dispatch problems, and (B-2) power flow problems.

(B-1) Economic dispatch using Lambda-iteration method:
Input: Quadratic fuel cost function; Total load demand; Generation limits.
Output: Optimal output of each generating unit (kW or MW); incremental cost ($/kWh or $/MWh); Total fuel cost ($/hour); Plot IC curves.
Please find the needed input data or make reasonable assumption.

(B-2) Power flow: a sample system is shown in Figure 1.
Input: Bus data (Table 1); Line data (Table 2); Select power flow solution algorithms
Output:

- Newton-Raphson – power flow solutions (see Table 3) and total power losses in MW and MVAR.
- Decoupled power flow – power flow solutions (see Table 4) and total power losses in MW and MVAR.
- DC (linear) power flow – power flow solutions.

Please check your power flow results using PowerWorld simulation, if possible. For (B-2), please note that you are required to submit your Matlab program as well as PowerWord simulation files.

Part B will be evaluated based on i) 8s-minute live demo and presentation (Microsoft PowerPoint), ii) written report (Microsoft Word or PDF), and iii) supporting files (Matlab program and PowerWorld files).

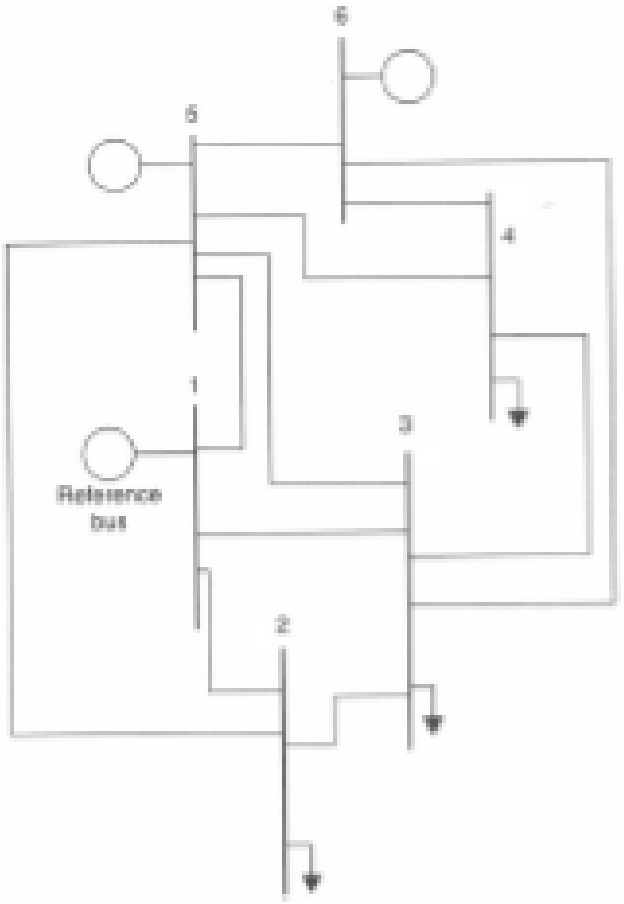

Figure 1. Six-bus Power System

Table 1. Bus Data (Base 100 MVA)

Bus	Type	V (p.u.)	Theta (°)	P_{gen} (p.u.)	Q_{gen} (p.u.)	P_{load} (p.u.)	Q_{load} (p.u.)
1	Slack bus	1.05	0	-	-	0	0
2	load bus	1.00	0	0	0	0.7	0.7
3	load bus	1.00	0	0	0	0.7	0.7
4	load bus	1.00	0	0	0	0.7	0.7
5	generator bus	1.05	0	0.5	-	0	0
6	generator bus	1.07	0	0.6	-	0	0

Table 2. Transmission Line Data (π circuit model)

From bus	To bus	R (p.u.)	X (p.u.)	Y/2 (p.u.)
1	2	0.05	0.20	0.02
1	3	0.08	0.30	0.03
1	5	0.10	0.20	0.02
2	3	0.20	0.40	0.04
3	4	0.10	0.30	0.03
5	2	0.05	0.10	0.01
5	3	0.10	0.30	0.02
5	4	0.07	0.20	0.025
5	6	0.05	0.25	0.03
6	3	0.12	0.26	0.025
6	4	0.02	0.10	0.01

Table 3. Newton-Raphson Power Flow Solutions (p.u.)

Bus	Type	V (p.u.)	Theta (°)	P_{gen} (p.u.)	Q_{gen} (p.u.)	P_{load} (p.u.)	Q_{load} (p.u.)
1	Slack bus					0	0
2	load bus			0	0	0.7	0.7
3	load bus			0	0	0.7	0.7
4	load bus			0	0	0.7	0.7
5	generator bus			0.5		0	0
6	generator bus			0.6		0	0
Total						2.1	2.1

Table 4. Decoupled Power Flow Solutions (p.u.)

Bus	Type	V (p.u.)	Theta (°)	P_{gen} (p.u.)	Q_{gen} (p.u.)	P_{load} (p.u.)	Q_{load} (p.u.)
1	Slack bus					0	0
2	load bus			0	0	0.7	0.7
3	load bus			0	0	0.7	0.7
4	load bus			0	0	0.7	0.7
5	generator bus			0.5		0	0
6	generator bus			0.6		0	0
Total						2.1	2.1