

1. (30 %) (a) 對數表。請編寫一個 MATLAB 程式，以產生在 1 到 10 之間，間隔為 0.1，且基底為 10 的對數表。這個對數表必須在新的頁面產生，而且要包含描述表格內容的標題，以及行列的名稱。這個表格必須如同以下的表格般排列。

	Table of Logarithms									
	X.0	X.1	X.2	X.3	X.4	X.5	X.6	X.7	X.8	X.9
1.0	0.000	0.041	0.079	0.114	...					
2.0	0.301	0.322	0.342	0.362	...					
3.0	...									
4.0	...									
5.0	...									
6.0	...									
7.0	...									
8.0	...									
9.0	...									
10.0	...									

- (b) 將(a)資料輸出到一個稱為 log_table.dat 的檔案中。

showtable.m

```
function [hUITable, hUITitle, fig] = showtable(hTable)
%SHOWTABLE Summary of this function goes here
% Input the table type, this function will render it for you
% Please set the table's VariableNames and RowNames in advance,
% they will correspond to uitable's ColumnName and RowName respectively.
% Set the table's description, it will become a disguised title.
hUITable = uitable('Data',table2array(hTable));
hUITable.ColumnName = hTable.Properties.VariableNames ;
hUITable.RowName = (hTable.Properties.RowNames)' ;
fig = gcf;
%Rescale the hTable&figure windows
hTExtent = get(hUITable,'Extent');
set(hUITable,'Position',[20 20 round(hTExtent(3)) round(hTExtent(4)
)]];
set(fig,'position',[200 200 round(1.1*hTExtent(3)) round(1.3*hTExtent(4)
)]];
%Set the title by using the description of the hTable
hUITitle = uicontrol('Style','text','BackgroundColor',[1 1 1], 'Position',[20 hTExtent(4)*1.15 hTExtent(3) 20], 'String', hTable.Properties.Description);
end
```

hw1.m

```
tmp = string([1:10]');  
logtable = array2table(reshape(log10([1:0.1:10.9]),10,10),'VariableNames',cellstr(strcat("X.",string([0:9]'))));  
logtable.Properties.RowNames = tmp  
logtable.Properties.Description = 'Table of Logarithms';  
showtable(logtable)  
writetable(logtable,'log_table.dat','WriteRowNames',true)  
type 'log_table.dat'
```

Figure

Table of Logarithms

	X.0	X.1	X.2	X.3	X.4	X.5	X.6	X.7	X.8	X.9
1	0	0.0414	0.0792	0.1139	0.1461	0.1761	0.2041	0.2304	0.2553	0.2788
2	0.3010	0.3222	0.3424	0.3617	0.3802	0.3979	0.4150	0.4314	0.4472	0.4624
3	0.4771	0.4914	0.5051	0.5185	0.5315	0.5441	0.5563	0.5682	0.5798	0.5911
4	0.6021	0.6128	0.6232	0.6335	0.6435	0.6532	0.6628	0.6721	0.6812	0.6902
5	0.6990	0.7076	0.7160	0.7243	0.7324	0.7404	0.7482	0.7559	0.7634	0.7709
6	0.7782	0.7853	0.7924	0.7993	0.8062	0.8129	0.8195	0.8261	0.8325	0.8388
7	0.8451	0.8513	0.8573	0.8633	0.8692	0.8751	0.8808	0.8865	0.8921	0.8976
8	0.9031	0.9085	0.9138	0.9191	0.9243	0.9294	0.9345	0.9395	0.9445	0.9494
9	0.9542	0.9590	0.9638	0.9685	0.9731	0.9777	0.9823	0.9868	0.9912	0.9956
10	1	1.0043	1.0086	1.0128	1.0170	1.0212	1.0253	1.0294	1.0334	1.0374

log_table.dat

Import - C:\Users\hoshinonori\Documents\MATLAB\homework4\log_table.dat

IMPORT VIEW

Delimited Column delimiters: Comma Range: A2: Output Type: Table

Fixed Width Delimiter Options Variable Names Row: 1 Text Option...

DELIMITERS SELECTION IMPORTED DATA UNIMPORTABLE CELLS

log_table.dat

Row Number	X0	X1	X2	X3	X4	X5	X6	X7	X8	X9
1	0	0.0413926...	0.0791812...	0.1139433...	0.1461280...	0.1760912...	0.2041199...	0.2304489...	0.2552725...	0.2787536...
2	0.3010299...	0.3222192...	0.3424226...	0.3617278...	0.3802112...	0.3979400...	0.4149733...	0.4313637...	0.4471580...	0.4623979...
3	0.4771212...	0.4913616...	0.5051499...	0.5185139...	0.5314789...	0.5440680...	0.5563025...	0.5682017...	0.5797835...	0.5910646...
4	0.6020599...	0.6127838...	0.6232492...	0.6334684...	0.6434526...	0.6532125...	0.6627578...	0.6720978...	0.6812412...	0.6901960...
5	0.6989700...	0.7075701...	0.7160033...	0.7242758...	0.7323937...	0.7403626...	0.7481880...	0.7558748...	0.7634279...	0.7708520...
6	0.7781512...	0.7853298...	0.7923916...	0.7993405...	0.8061799...	0.8129133...	0.8195439...	0.8260748...	0.8325089...	0.8388490...
7	0.8450980...	0.8512583...	0.8573324...	0.8633228...	0.8692317...	0.8750612...	0.8808135...	0.8864907...	0.8920946...	0.8976270...
8	0.9030899...	0.9084850...	0.9138138...	0.9190780...	0.9242792...	0.9294189...	0.9344984...	0.9395192...	0.9444826...	0.9493900...
9	0.9542425...	0.9590413...	0.9637878...	0.9684829...	0.9731278...	0.9777236...	0.9822712...	0.9867717...	0.9912260...	0.9956351...
10	1	1.0043213...	1.0086001...	1.0128372...	1.0170333...	1.0211892...	1.0253058...	1.0293837...	1.0334237...	1.0374264...

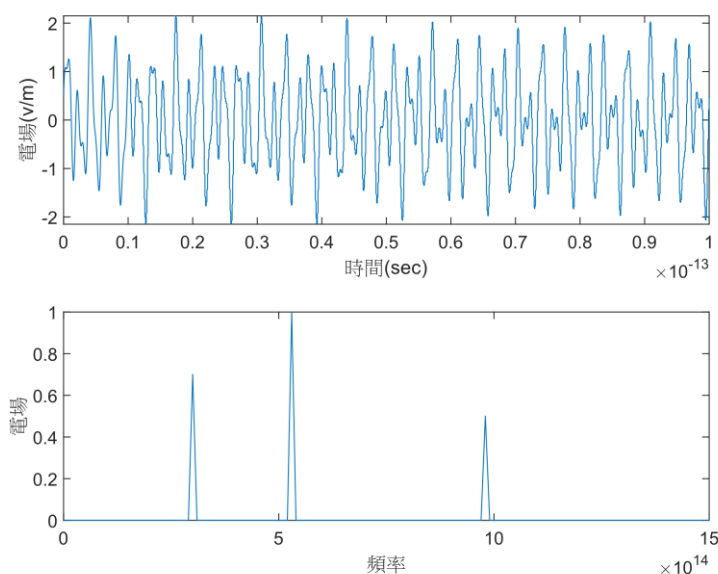
log_table.dat

2. (30 %) 所附 time_hw.csv 檔為實驗測量到的電場隨(v/m)時間(sec)變化的資料，請撰寫一個程式讀入此檔案的所有資料，並將此資料做離散傅立葉轉換 (discrete Fourier transform，Matlab fft 函數)，最後將電場 vs.時間與電場 vs.頻率的圖形畫在同一個視窗(上、下排列)中，電場-頻率圖的橫座標範圍為 0~1.5e15. 並列出此信號所有主頻率.

hw2.m

```
ftmp = fopen('time_hw.csv');
data = textscan(ftmp, '%s', 'Delimiter', '\n|,');
fclose(ftmp);
data = str2double(reshape(data{1}, 2, 10000));
subplot(2,1,1)
plot(data(1,:), data(2,:))
xlabel('時間(sec)')
ylabel('電場(v/m)')
Fs = 1/data(1,2);
P = abs(fft(data(2,:))/10000);
P = P(1:10000/2+1);
P(2:end-1) = 2*P(2:end-1);
subplot(2,1,2)
plot(Fs*(0:(10000/2))/10000, P)
xlim([0, 1.5*10^15]);
xlabel('頻率')
ylabel('電場')
```

Figure



3. (20 %) 所附 table_input.dat 檔為某大學科系/所屬學院/學生人數之資料，請撰寫一個程式讀入此檔案的所有資料，並完成以下工作:

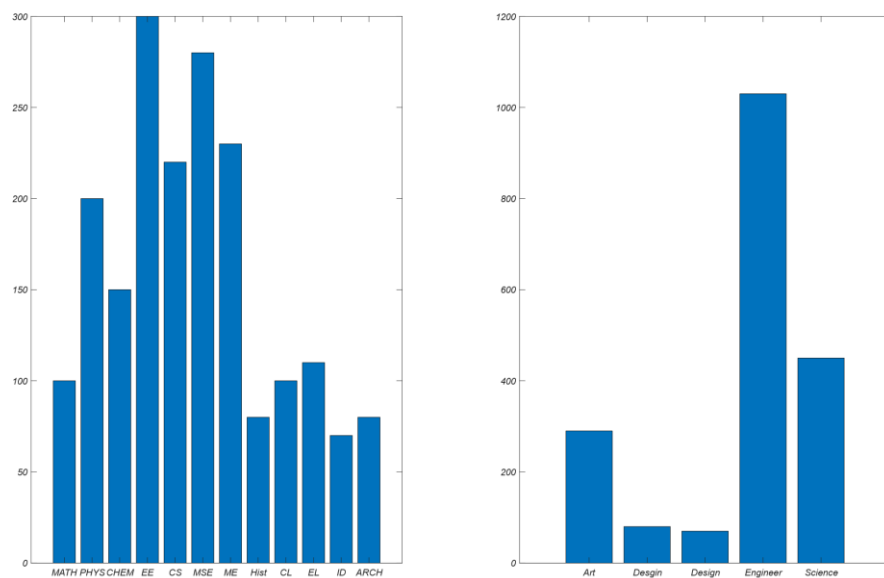
(1) 畫出全校各科系學生人數長條圖(bar graph).

(2) 計算各學院之學生總數，並畫出各學院學生總數長條圖.

hw3.m

```
[D C N] = textread('table_input.dat','%s%s%d');  
Map = containers.Map(unique(C),zeros(size(unique(C))));  
for index = 1:size(N)  
    Map(char(C(index))) = Map(char(C(index))) + N(index);  
end  
subplot(1,2,1)  
bar(1:size(N),N)  
set(gca, 'xticklabel', D);  
subplot(1,2,2)  
bar(1:size(Map),cell2mat(Map.values))  
set(gca, 'xticklabel', Map.keys);
```

Figure



4. (20 %) 請將 `A=magic(10)` 的資料以 `uint8` 的資料型態存入一個二進位檔案 `mytest.bin` (使用 `fwrite`)，再用 `fread` 指令將此資料讀至工作空間的變數 `B`，最後比較 `A` 與 `B` 的異同。

hw4.m

```
A=magic(10);  
FID = fopen('mytest.bin','w');  
fwrite(FID,A,'uint8');  
fclose(FID);  
FID = fopen('mytest.bin');  
B = fread(FID);  
fclose(FID);
```

whos

Name	Size	Bytes	Class	Attributes
A	10x10	800	double	
B	100x1	800	double	

B == A(:)