



colegsirgâr

EXAMINATION INTERNAL VERIFICATION FORM (2017-2018)

MODULE :	PSDE4003 Engineering Mathematics			LEVEL:	4
PROGRAMME :	HNC Electrical and Electronic Engineering			TERM OF EXAM: (SPRING OR SUMMER)	n/a
LEARNING OUTCOME(S) BEING ASSESSED:	MILO1, MILO 2	EXAM PAPER:	Main Class Test 3	EXAMINATION AUTHOR :	A. Thomas

VERSION:	DATE SUBMITTED FOR VERIFICATION:	INTERNAL VERIFIER COMMENTS (Approval or detail of amendments required):	DATE:
1.	16/4/2018	Clear instructions are given to the candidates	18/4/2018
2.		The standard of work is commensurate with that of a HNC level as approved by the awarding body.	

INTERNAL VERIFIER PLEASE TICK TO INDICATE THAT THE EXAMINATION:

✓	Conforms to the assessment pattern described in the module syllabus
✓	Tests the module learning outcome(s) appropriately

SIGNATURES OF FINAL APPROVAL:

SIGNATURE	DATE
<i>Nigel H. Davies</i>	18/4/2018
INTERNAL VERIFIER: I confirm that this version of the exam paper is ready to be sent to the external examiner	
EXAM AUTHOR: I confirm that internal verifier and external examiner approval have been received and that this version of the exam paper is ready for printing.	

HNC Electrical and Electronic Engineering**PSDE4003 Engineering Mathematics**

Level 4, Year 1

Class Test 3 (2017-18)

This is an open book test, worth **15%** of the module mark and addresses Module Intended Learning Outcome 3.

Date of test =

Time allowed = 1 hour

Answer all questions

Open a Word file, put your name in a header and at the end of the exam copy your Matlab commands and output to the file.

Either

- Print off your Word document and hand in before leaving the exam room, or
- email your Word file as an attachment to me at: ainsley.thomas@colegsirgar.ac.uk

Please keep a copy of your work in case of any problems with your email.

Marks

1. If $x = 1.4$ and $y = 1.59$, evaluate using 'assignment statements':

a) $x^2 - y$ b) $(2y)^{x-y}$ c) e^{2xy} d) $\log_{10}(y^x - x)$

[12]

2. If $Q = \begin{bmatrix} \frac{2}{\sqrt{8}} & \frac{2}{\sqrt{8}} \\ \frac{2}{\sqrt{8}} & -\frac{2}{\sqrt{8}} \end{bmatrix}$ and the matrix $X = \begin{bmatrix} 3 & 4 \\ -1 & 0 \end{bmatrix}$

- a) Show that $Q^T = Q^{-1}$
b) Show that $(QXQ^T)^6 = QX^6Q^T$

[20]

3. On the same set of axes, plot the graphs of $y = 2\cos x$ and $y = 3\sin x$ for $-\pi \leq x \leq \pi$. Copy the figure window and your commands to your Word file. Zoom into each of the points of intersection, and copy the resultant figures into your Word file. Hence, give the coordinates of the two points of intersection, correct to **2 decimal places**.

[27]

4. If $y = 4e^x \sin x$, use Matlab to find $\frac{dy}{dx}$, $\frac{d^2y}{dx^2}$ and $\frac{d^4y}{dx^4}$

Show that $\left(\frac{d^4y}{dx^4}\right)^2 + 2\left(\frac{d^2y}{dx^2}\right)^2 + 4y^2 = -64e^{2x}(3\cos x^2 - 5)$

[18]

5. x and y are related by the equation $y = mx + c$:

x	14	18	23	30	50
y	900	1200	1600	2100	3800

- (i) Input the data and use polyfit to find the best fit values of m and c .
- (ii) Use polyval to find the estimated values of y
- (iii) Draw a graph showing the data and the least squares regression line.

[12]

6. The table shows the time taken for 12 operatives to produce a component:

22.8	22.6	22.4	25.1	21.6	24.6
21.7	21.9	21.7	22.8	23.2	21.9

Find: (i) the mean (ii) the median (iii) the standard deviation

[11]

Qu 1

```
>> x=1.4;y=1.59;
```

```
>> x^2-y
```

```
ans =
```

```
0.3700
```

```
>> (2*y)^(x-y)
```

```
ans =
```

```
0.8027
```

```
>> exp(2*x*y)
```

```
ans =
```

```
85.7984
```

```
>> log10(y^x-x)
```

```
ans =
```

```
-0.2890
```

(3 marks each = 12)

Qu 2

```
>> Q=[2/sqrt(8) 2/sqrt(8);2/sqrt(8) -2/sqrt(8)]
```

```
Q =
```

```
0.7071 0.7071
```

```
0.7071 -0.7071    (4)
```

```
>> X=[3 4;-1 0]
```

```
X =
```

```
3 4
```

```
-1 0    (4)
```

```
>> Q'
```

```
ans =
```

Matlab Test
2017-18

```
0.7071  0.7071
```

```
0.7071 -0.7071    (2)
```

```
>> Q^-1
```

```
ans =
```

```
0.7071  0.7071
```

```
0.7071 -0.7071    (2)
```

```
>> (Q*X*Q')^6
```

```
ans =
```

```
-91.0000  45.0000
```

```
-180.0000  44.0000    (4)
```

```
>> Q*X^6*Q'
```

```
ans =
```

```
-91.0000  45.0000
```

```
-180.0000  44.0000    (4)
```

(Qu 2 total = 20)

Qu 3

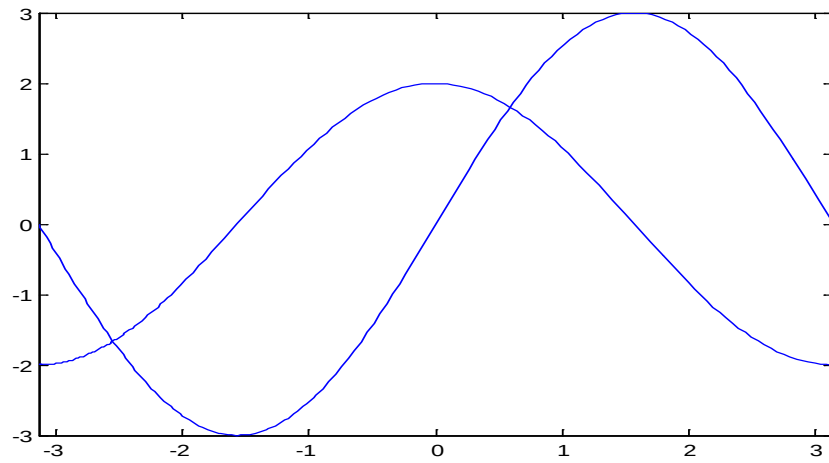
```
>> fplot('2*cos(x)',[-pi,pi])    (5)
```

```
>> hold    (2)
```

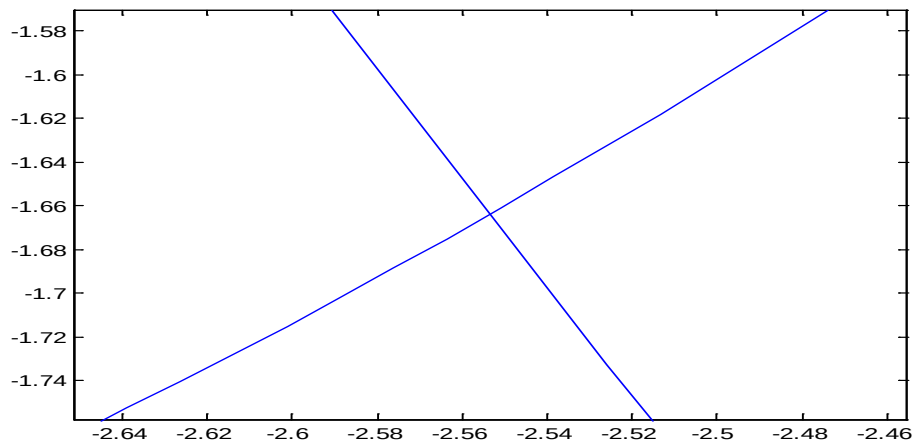
Current plot held

```
>> fplot('3*sin(x)',[-pi,pi])    (5)
```

Matlab Test
2017-18



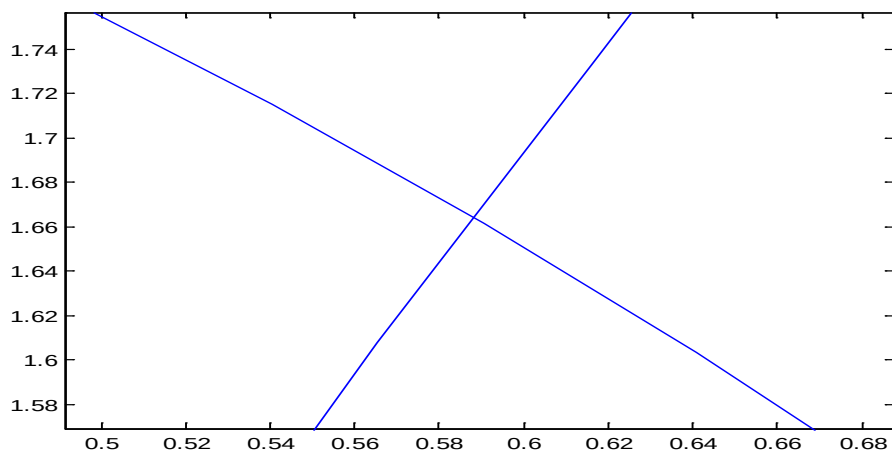
(3)



(3)

Point of intersection (-2.55, -1.67)

(3)



(3)

Point of intersection (0.58, 1.66)

(3)

(Qu 3 total = 27)

Qu 4

```
>> clear all
```

```
>> syms x
```

```
>> y=4*exp(x)*sin(x) (3)
```

```
y =
```

```
4*exp(x)*sin(x)
```

```
>> y1=diff(y) (3)
```

```
y1 =
```

```
4*exp(x)*cos(x) + 4*exp(x)*sin(x)
```

```
>> y2=diff(y,2) (3)
```

```
y2 =
```

```
8*exp(x)*cos(x)
```

```
>> y4=diff(y,4) (3)
```

```
y4 =
```

```
-16*exp(x)*sin(x)
```

```
>> y4^2+2*y2^2+4*y^2 (3)
```

```
ans =
```

```
128*exp(2*x)*cos(x)^2 + 320*exp(2*x)*sin(x)^2
```

```
>> simplify(ans) (3)
```

```
ans =
```

```
-64*exp(2*x)*(3*cos(x)^2 - 5)
```

(Qu 4 total = 18)

Qu 5

clear all

```
>> x=[14 18 23 30 50];
```

 (1)

```
>> y=[900 1200 1600 2100 3800];
```

 (1)

```
>> p=polyfit(x,y,1)
```

 (2)

p =

80.5970 -256.1194

```
>> yfit=polyval(p,x)
```

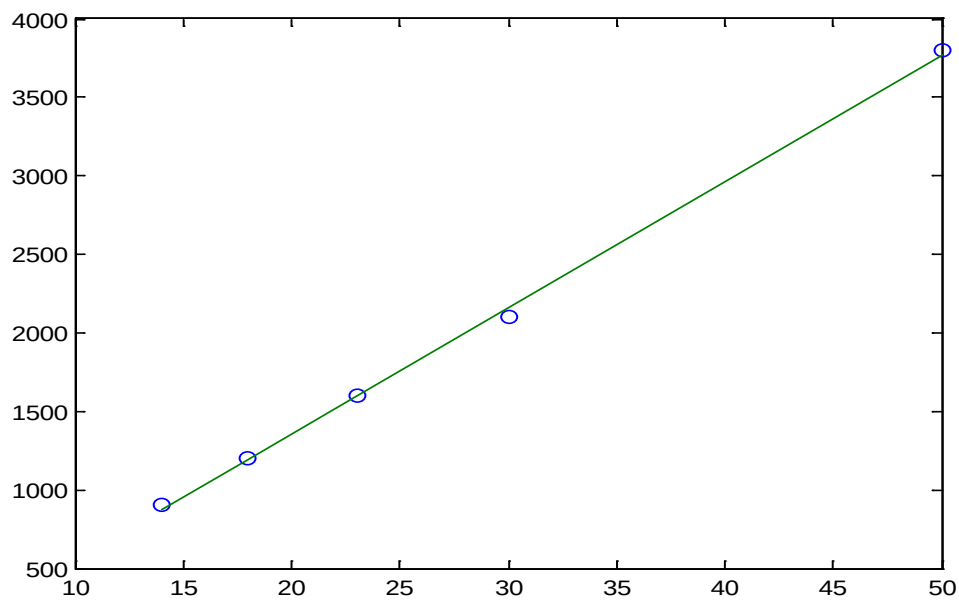
 (2)

yfit =

1.0e+003 *

0.8722 1.1946 1.5976 2.1618 3.7737

```
>> plot(x,y,'o',x,yfit)
```

 (3)

(3)

(Qu 5 total = 12)

Matlab Test
2017-18

Qu 6

clear all

>> t=[22.8 22.6 22.4 25.1 21.6 24.6 21.7 21.9 21.7 22.8 23.2 21.9]; **(5)**

>> xbar=mean(t),m=median(t),s=std(t,1) **(6)**

xbar =

22.6917

m =

22.5000

s =

1.0889

(Qu 6 total = 11)