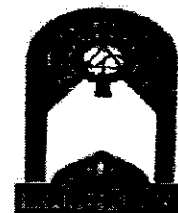


**University of Technology**  
**Department of Laser & Optoelectronics Engineering**  
**Final Examination 2011/2012**



**Subject: Computer Applications**  
**Division: Laser & Optoelectronics**  
**Examiner: Assist. Lec. Ahmed Chyad**

**Class: Third year**  
**Time: 3 hours**  
**Date: 12/6/2012**

**Answer Only Five Questions**

**Q1:** Beam splitter is assumed to be a plane parallel plate. Fringe pattern depending on  $D$  for wavelength  $\lambda = 0.0005$ , and depending on wavelength  $\lambda$  for  $D = 0.003$ . The angle  $\theta = 0$ . All lengths in mm. Plot  $I_1(D)$  and  $I_2(\lambda)$  using subplot.

1. Dependence on  $D$ .

$$\theta := 0 \quad \lambda := 0.0005$$

$$D := 0.027, 0.02701 \dots 0.0325$$

$$I_1(D) := \cos \left( \frac{2 \cdot \pi \cdot D \cdot \cos(\theta)}{\lambda} \right)^2$$

2. Dependence on  $\lambda$

$$\lambda := 0.0004, 0.000401 \dots 0.0008$$

$$D := 0.003$$

$$I_2(\lambda) := \cos \left( \frac{2 \cdot \pi \cdot D \cdot (\theta)}{\lambda} \right)^2$$

**Q2:** Three phasors are defined as  $A = 3 \angle 60^\circ$ ,  $B = -4 \angle 30^\circ$  and  $C = 5 \angle -45^\circ$ . Create a simulink model to display the result of the operation  $A - B + C$ .

**Q3:** Consider the following:

$$x_n = 1 - \cos \left( \frac{\pi}{n} \right)$$

$$y_n = 2 \sin^2 \left( \frac{\pi}{2n} \right)$$

- (a) Subplot #1: Plot  $x_n$  and  $y_n$  versus  $n$  for  $n = 1, \dots, 1000$  on a single log-log plot using the `loglog` command. Use a solid line for  $x_n$  and open circles for  $y_n$ .
- (b) Subplot #2: Plot the relative error  $|x_n - y_n|/|y_n|$  on a log-log plot using the `loglog` command.

2- Find the mathematical expression for the computation to be done by the following MATLAB statements.

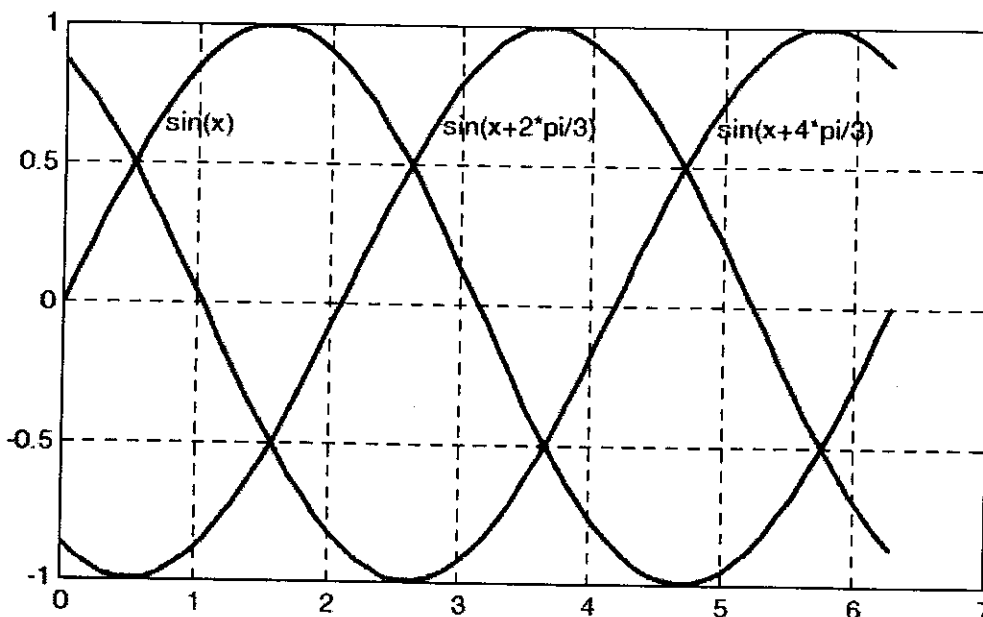
3- Write a MATLAB statement that performs the following computation.

$$\left( \sum_{n=0}^{10000} \frac{1}{(2n+1)^2} \right) - \frac{\pi^2}{8}$$

(a) A mesh-shaped graph

(b) A contour-shaped graph

**Q6:** Create a simulink model to display three phase waveforms as shown in the following figure.



قلب الصفحه رعاء

*[Signature]*

Q1)

تجربة 60

$$\lambda_{\text{apda}} = 0.005 \times 10^{-3};$$

Theta = 0; % Dependence on D

$$D = 0.027 \times 10^{-3} : 10^{-5} : 0.0325 \times 10^{-3};$$

$$I_1 D = \cos\left(2 \times \pi \times D \times \cos(\theta) / \lambda_{\text{apda}}\right)^2;$$

subplot(2,1,1)

plot(D, I\_1 D)

grid on

xlabel('D')

ylabel('I\_1(D)')

title('Beam splitter')

$$\lambda_{\text{apda2}} = 0.0004 \times 10^{-3} : 10^{-6} : 0.0008 \times 10^{-3};$$

$$D_2 = 0.003 \times 10^{-3};$$

$$I_2 \lambda_{\text{apda2}} = \cos\left(2 \times \pi \times D_2 \times \cos(\theta) / \lambda_{\text{apda2}}\right)^2;$$

subplot(2,1,2)

plot(lambda2, I\_2 lambda2)

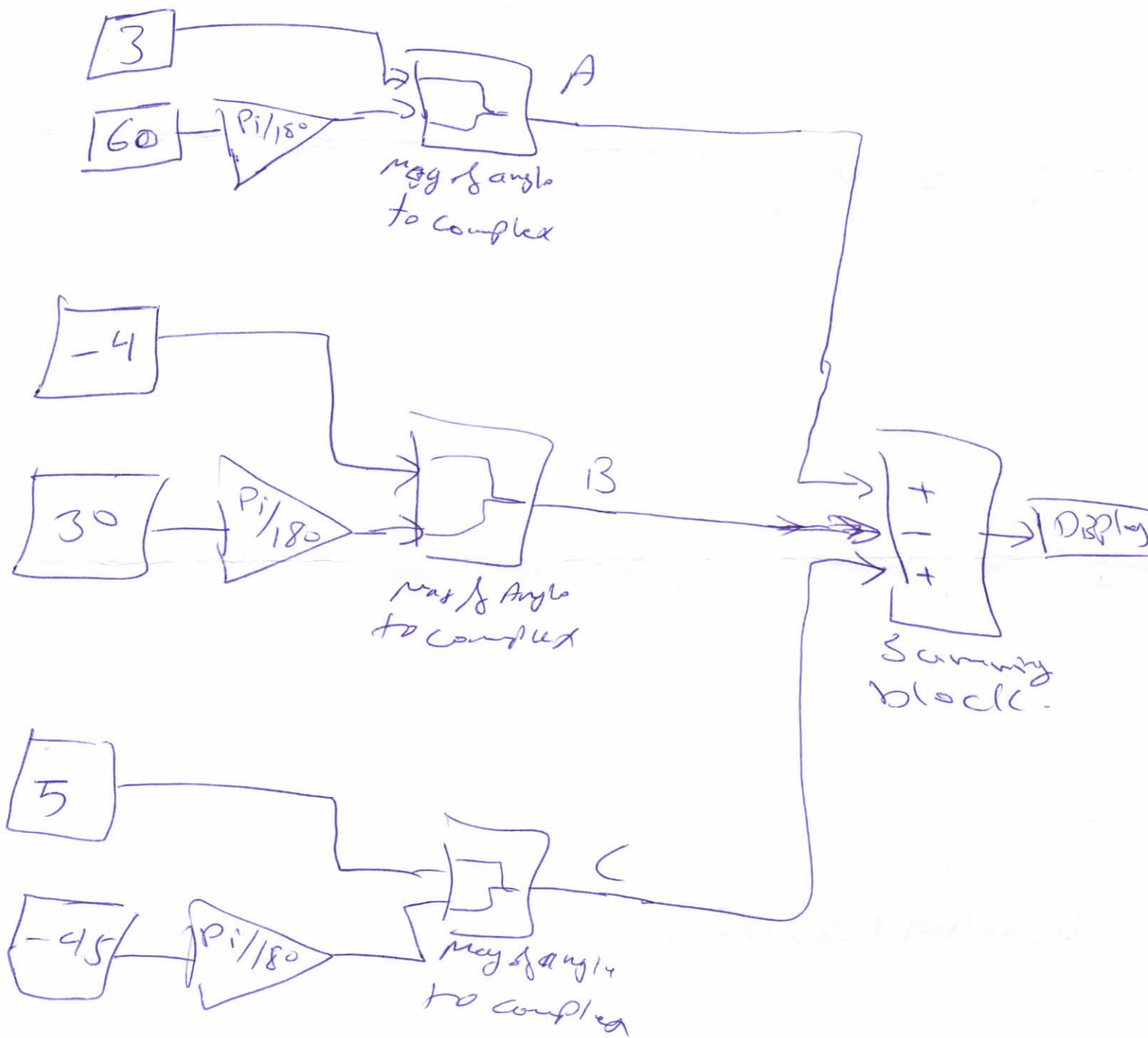
grid on

~~subplot~~  
xlabel('lambda2')

ylabel('I\_2 lambda2')

title('Beamsplitter')

Q2)  $A = 3 \angle 60^\circ$ ,  $B = -4 \angle 30^\circ$ ,  $C = 5 \angle -45^\circ$   
 $Y = A - B + C$



Q3)

$$X_n = 1 - \cos\left(\frac{\pi}{n}\right), \quad Y_n = 2 \sin^2\left(\frac{\pi}{2n}\right)$$

(a)  $n = 1 : 0.1 : 1000$ ;

$$X = 1 - \cos(\pi/n);$$

~~subplot(2,1,1)~~

~~plot~~

$$Y = 2 \sin(\pi/(2n))^2;$$

subplot(2,1,1)

plot(n, X)

hold on

loglog(n, Y)

grid on

xlabel('n')

ylabel('x & y')

$$\text{Error} = \text{abs}(X - Y) ./ \text{abs}(Y);$$

subplot(2,1,2)

~~plot(n, Error)~~

loglog(n, Error)

grid on

xlabel('n')

ylabel('Error')

title('Error plot')

Q4) Ans) ① we know the size of array  
by using size command

example)  $A = [1\ 2\ 3\ 4\ 5\ 6\ 7\ 8\ 9]$ ,

$B = \text{size}(A)$

② 
$$S = \sum_{n=0}^{100} 2^{-n}$$

③ signs  $n$ ;

$$x = \text{symsum}\left(\frac{1}{(2n+1)^2}, 0, 10000\right) - \pi^2/8$$

Q4)



Q5)  $f(x) = x_1^2 + x_2^2$ ,  ~~$h(x) = x_1 + x_2 - 2 = 0$~~

$$h(x) = x_1 + x_2 - 2 = 0$$

$$-5 \leq x_1 \leq 5, -5 \leq x_2 \leq 5$$

Q6)

