



Answer all the following questions || No. of questions : 6 || Total Mark: 100 Marks

Question (1) (10 Marks)

Which of the following is a suitable user-defined function name? Explain your answer.

Switch – while – add2 – input – 2add

Answer

Name	Valid or not	Reason
Switch	valid	the first letter is capital, which is different from the reserved word "switch"
while	not valid	reserved word
add2	valid	
input	not valid	reserved word
2add	not valid	begin with number

Question (2) (10 Marks)

What is the value of "r" in the following Matlab Expressions?

a)	<code>r = round(2.51)</code>	d)	<pre> x = 1; y = 23; r = 1; if (x > 0) r = 2; elseif (y < -2) r = 3; else r = 4; end </pre>
b)	<code>r = ceil(2.51)</code>		
c)	<pre> x = [2 , 3, 4] y = [1, 2] r = x-y </pre>		

Answer

a) r=3
b) r=3
c) error , dimension mismatch
d) r=2

Question (3) (20 Marks)

Answer the following questions for the array shown here.

$$C = \begin{bmatrix} 1 & 4 & 5 \\ 5 & 1 & 4 \\ 2 & 3 & 10 \end{bmatrix}$$

- a) What is the size of C ?
- b) What is the value of C(2,3)?
- c) List the subscripts of all elements containing the value 5
- d) Write a code to find the index of all elements whose values are greater than 9

Answer

- a) Size(C) = [2 , 2]
- b) C(2,3) = 4
- c) Subscript = [2, 7]
- d) find(C>9)

Question (4) (10 Marks)

Sketch the results of executing the following code

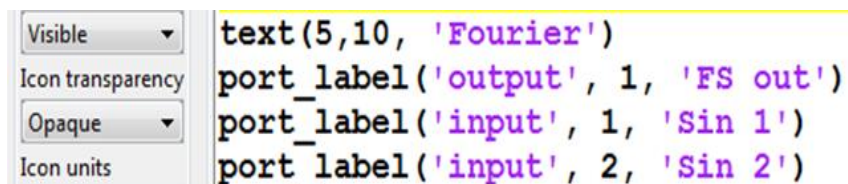
```
figure
subplot(2,2,1)
x = 0:pi/10:2*pi;
y1 = sin(x);
plot(x,y1);
subplot(2,2,4)
y2 = cos(x);
plot(x,y2);
```

Answer

Sin(x) here	
	Cos(x) here

Question (5) (30 Marks)

- a) What is the meaning of saying that VHDL is a strongly-typed language?
- b) What is the difference between ASIC and FPGA designs?
- c) What is the difference between fixed and variable-step options of the Simulink solvers?
- d) How to improve the resolution of the simulated signals on Simulink?
- e) The Simulink blocks are designed to accept signals and parameter values as vector inputs, what the benefits of that?
- f) Sketch the subsystem block whose mask is defined by the code in the following figure

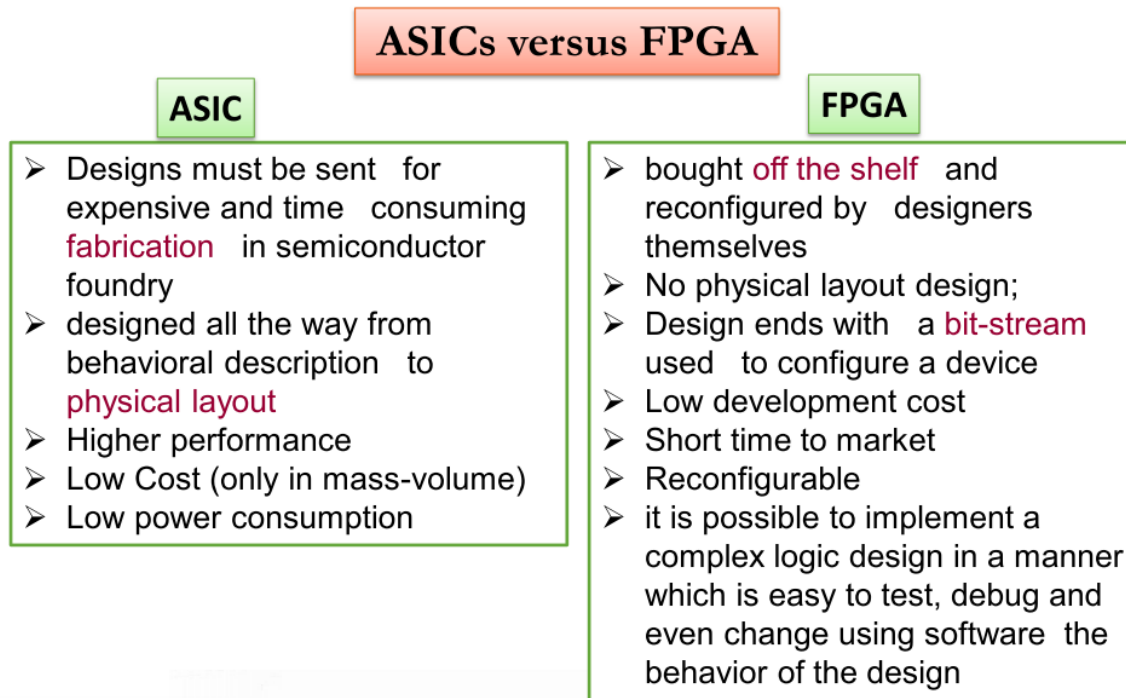


The image shows a Simulink mask editor interface. On the left, there are four control elements: 'Visible' (dropdown), 'Icon transparency' (dropdown), 'Opaque' (dropdown), and 'Icon units' (dropdown). On the right, there is a text area containing the following MATLAB code:

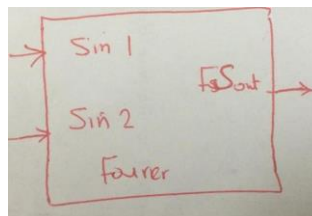
```
text(5,10, 'Fourier')
port_label('output', 1, 'FS out')
port_label('input', 1, 'Sin 1')
port_label('input', 2, 'Sin 2')
```

Answer

- a) VHDL is a strongly-typed language means an object can only be assigned with a value of its type
- b) **The difference between ASIC and FPGA designs:**



- c) **The difference between fixed and variable-step options of the Simulink solvers:**
- With a fixed-step solver, the step size remains constant throughout the simulation
 - With a variable-step solver, the step size can vary in an adaptive fashion from step to step to maximize efficiency, while meeting specified error tolerances
- d) **To improve the resolution of the simulated signals on Simulink:**
change the step size from auto to small values like 1e-4
- e) **The benefits of making the Simulink blocks accept signals and parameter values as vector inputs:**
is to use this vector parameters to deals with multiple inputs and produce multiple outputs
- f) Sketch of the output block:



Question (6) (20 Marks)

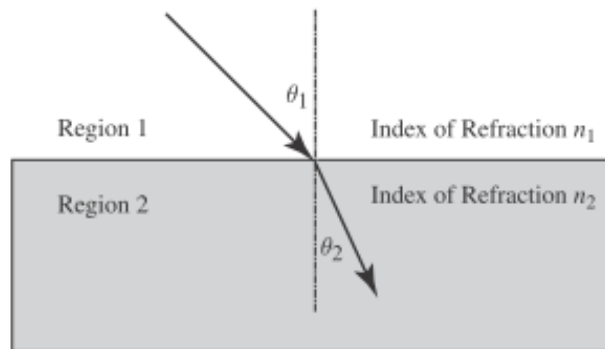
When a ray of light passes from a region with an index of refraction (n_1) into a region with a different index of refraction (n_2), the light ray is bent (check the Figure). The angle at which the light is bent is given by Snell's law:

$$n_1 \sin \theta_1 = n_2 \sin \theta_2$$

Where θ_1 is the angle of incidence of the light in the first region and θ_2 is the angle of incidence of the light in the second region. Using Snell's law, it is possible to predict the angle of incidence of a light ray in Region 2 if the angle of incidence in Region 1 and the indices of refraction are known. The equation to perform this is:

$$\theta_2 = \sin^{-1}\left(\frac{n_2}{n_1} \sin \theta_1\right)$$

- Write a program to calculate the angle of incidence (in degrees) of a light ray in Region 2 given the angle of incidence in Region 1 and the indices of refraction.
- If, then for some angles, the required angle will have no real solution, because the absolute value of the quantity will be greater than 1.0. When this occurs, all light is reflected back into Region 1, and no light passes into Region 2 at all. Your program must be able to recognize and properly handle this condition.



Answer

```
%% This code to calculate the angle of refraction in the second medium
%% It may be solved using user-defined function or m-file script as this one

n1= 1.2; % refractive index of the first medium
n2= 1.3; % refractive index of the second medium
theta_1 = 30; % Angle of incidence in the first medium

%% Calculating the quantity

quant = n1*sind(theta_1)/n2;
if quant>=1
    display('Total Internal reflection case, all incident wave is reflected back ')
else
    display('Angle in the second medium is: ')
    theta_2 = asind(quant)
end
```