Course outline

course work?

Week 0

MATLAB

Week 1

How does an NPTEL online

 Course Background and Learning Outcome

Bottleneck

Beyond

Platform

and Circuits

Week 2

Week 3

Week 4

Week 5

Week 6

Week 8

Week 9

Week 10

Week 11

Week 12

**Download Videos** 

Progress in Optical

Moore's Law and Interconnect

Interconnect Technology and

Evolution of Silicon Photonics

Quiz: Week 1: Assignment 1

Integrated Photonics Devices

Week 1: Lecture notes

Week 1 Feedback Form:

1 point

NPTEL » Integrated Photonics Devices and Circuits

## Week 1: Assignment 1 The due date for submitting this assignment has passed.

Due on 2021-08-18, 23:59 IST. As per our records you have not submitted this assignment.

Accepted Answers:

Accepted Answers:

False

Mark whether the following statements are True or False (Answer the questions 1 - 10) According to Moore's Law, the number of transistor per microchip are doubled in every two years. 1 point

Ion implantation technique did not help to scale down channel length of a MOS transistor.

6) A sub-micron size silicon wire shown in Figure. 1 is not at all suitable for guiding an optical mode.

O True False No, the answer is incorrect. Score: 0

True An optical waveguide can not be fabricated using standard CMOS process.

O True False No, the answer is incorrect. Score: 0

Stacking of electrical interconnects in to multiple layers helps to reduce the interconnect delay. 1 point O True

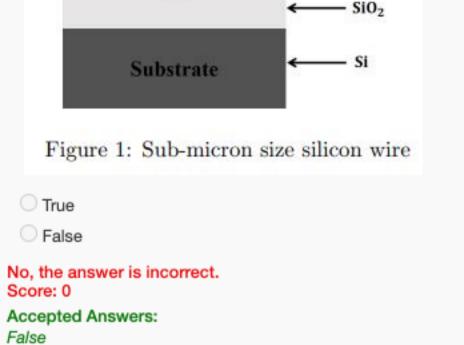
False No, the answer is incorrect. Score: 0 Accepted Answers: True

 A MOS transistor operating voltages can be scaled down by reducing its dimensions. 1 point True

No, the answer is incorrect. Score: 0 Accepted Answers: True

True False No, the answer is incorrect. Score: 0 Accepted Answers: False

Si



8) Monolithic integration of electronic and photonic devices are possible in bulk silicon.

technology.

False

Score: 0

True

False

True

False

Laser source

Modulator

Laser source

Modulator

Photo-detector

Silicon (Si)

Score: 0

Germanium (Ge)

Galium-Arsenide (GaAs)

Lithium niobate (LiNbO<sub>3</sub>)

No, the answer is incorrect.

No, the answer is incorrect.

increase and decrease

Accepted Answers:

Score: 0

Score: 0

dB/cm

O dB/m

Score: 0

dB/cm

Score: 0

6 dB

Accepted Answers:

No, the answer is incorrect.

Accepted Answers:

Photo-detector

Photo-detector

O True

Accepted Answers:

Accepted Answers:

False No, the answer is incorrect. Score: 0

The speed of operation of an optical interconnect can be improved if the feature sizes are reduced with the help of state-of-the-art VLSI

True False No, the answer is incorrect.

True False No, the answer is incorrect. Score: 0 Accepted Answers:

9) At a given temperature, excess electron/hole concentration results into no change in refractive index in semiconductors.

No, the answer is incorrect. Score: 0 Accepted Answers: True 11) The component needed in any standard optical interconnect, to transfer the data from the electrical signal into optical signal is

Optical interconnects are preferred over electrical interconnects for high-speed data transmission because of bandwidth limitation.

 Transistor No, the answer is incorrect. Score: 0 Accepted Answers: Modulator

12) The component needed in any standard optical interconnect, to transfer the data from the optical signal into electrical signal is

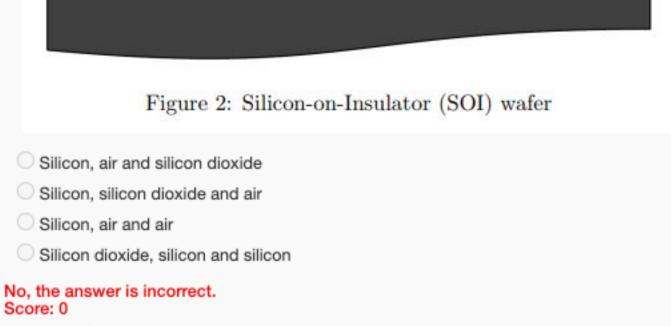
 Transistor No, the answer is incorrect. Score: 0 Accepted Answers:

13) The speed of operation of a standard CMOS electronic integrated circuit fabricated using the 45 nm technology, is limited by Gate delay Interconnect delay

 no limitations Gate and interconnect delay No, the answer is incorrect. Score: 0

Accepted Answers: Interconnect delay Name the standard material used to design and manufacture high-speed electro-optic modulators.

Accepted Answers: Lithium niobate (LiNbO<sub>3</sub>) 15) If a silicon waveguide is fabricated on a 220 nm (device layer thickness) silicon-on-insulator (SOI) wafer, shown in Figure. 2. What materials would be referred as the core, lower cladding and upper cladding of the waveguide



Device Layer (SOI)

Silicon Dioxide (BOX)

Silicon Substrate

Accepted Answers: Silicon, silicon dioxide and air

16) Which of the following materials was used to demonstrate working transistor for the first time? Silicon (Si) Galium Arsnide (GaAs) Germanium (Ge) Lithium Niobate (LiNbO<sub>3</sub>)

Germanium (Ge) 17) At a given wavelength and temperature, the presence of free electrons and free holes in a bulk material will \_\_\_ 1 point refractive index of the material, respectively. increase and increase

 decrease and increase decrease and decrease No, the answer is incorrect.

Accepted Answers: decrease and decrease

18) Today's optical waveguides fabricated in Silicon-on-Insulator platform and operating at  $\lambda \sim 1550$  nm show propagation losses in the order of **1 point** ○ dB/µm

dB/km No, the answer is incorrect.

In a 1-cm-long optical waveguide, the signal is attenuated by 25%. What is the loss in dB?

2 dB 4 dB 6 dB 8 dB