Menoufia University, Faculty of Electronic Engineering,
Computer Science & Engineering Department.
Fourth Year- Second Semester
Embedded Systems (CSE 421)
Examiner: Dr. Salah Eldin Shaban

Mid Term Exam
Date: 30/03/2019
Time: One Hour (From 9:30 am)
Total Mark: 20 Marks
No. of Pages: Two

اسم الطالب: الرقم الجامعي: الفصل:

Answer All the Following Two Questions

First Question **30 Min/ 10 Marks**

(a) Complete each of the following statements:

[1] ..... is a specialized hardware tool that can help debug software in a working embedded system.

[2] ..... is the period in which a given product is in demand and would yield the highest sales.

[3] ..... is essentially a catalog of pre-existing implementations.

[4] ..... is the inability for designer productivity to keep pace with chip capacity growth.

[5] ..... is the time instant by which a system's execution (or service) is required to be completed.

[6] ..... refers to a set of related signals and it is used to avoid the confusion.

(b) The design of a disk drive has an NRE cost of $100,000 and a unit cost of $20. How much will we have to add to the cost of each product to cover our NRE cost, assuming we sell 10,000 units?

(c) For the transfer data between the CPU and the memory over the bus, calculate the total transfer time of reading a 320 x 240 video frame into the CPU at the rate of 30 frames/sec. Assume that the bus has a 1-MHz clock rate and is two bytes wide, with D = 1 and O = 3.

Second Question **30 Min/ 10 Marks**

(a) Draw a timing diagram with the following signals (where $[t_1, t_2]$ is the time interval starting at t_1 and ending at t_2):

[1] Signal **A** is stable [0, 10], changing [10, 15], stable [15, 30].

[2] Signal **B** is 1 [0, 5], falling [5, 7], 0 [7, 20], changing [20, 30].

[3] Signal **C** is changing [0, 10], 0 [10, 15], rising [15, 18], 1 [18, 25], changing [25, 30]

(b) A computer system uses 32-bit memory addresses. It has a 128 K-byte 8-way set associative cache, with 64 bytes per cache line. Assume that the size of each memory word is 1 byte. Calculate the number of bits in each of the Tag, Set, and Word fields of the memory address.

(c) Consider an image of 320 x 240 pixels with each pixel composed of 3 bytes of data. If these images are video frames, check if you can push one frame through the system within the 1/30 sec to process it before the next one arrives. Assume that the bus has a 1-MHz clock rate.