

• Answer all the following questions

• Total Mark: 15 Marks

**Question (1) (5 Marks)**

Choose the correct answer (put your answer in a table format):

- 1) ..... include on-chip memory.  
a) Microprocessors                      b) Microcontrollers                      c) 555 timers                      d) Op-Amps
- 2) ..... is the most costly stage in the life cycle of an embedded system.  
a) Growth                      b) Birth                      c) Design
- 3) Control bus is .....  
a) single direction                      b) bi direction                      c) tri direction                      d) quad direction
- 4) The status of the flags depends on the size of the ALU operands.  
a) True                      b) False
- 5) ..... holds the address of the next instruction  
a) Stack Pointer                      b) Instruction Register                      c) Program Counter                      d) Status Register
- 6) Registers are considered the ..... form of storage.  
a) slowest                      b) fastest
- 7) Control unit finite state machine cycles forever for ..... states.  
a) two                      b) three                      c) five                      d) seven                      e) infinite
- 8) RISC processors have ..... length instructions.  
a) variable                      b) fixed                      c) short                      d) large
- 9) ..... is not among the software factors that affecting system performance.  
a) Algorithm complexity                      b) Task Scheduling                      c) Handshaking                      d) Parallelism level
- 10) NRE costs are .....  
a) fixed                      b) variable                      c) depending on the volume

**Question (2) (5 Marks)**

1. Define embedded systems and mention some of their characteristics.
2. Mention the main components in the structure of embedded systems.
3. Discuss the embedded systems life cycle.
4. List five of the design constraints and briefly discuss two of them.
5. Explain the two types of registers.

**Question (3) (5 Marks)**

1. Calculate the total cost of producing 10,000 *mp3 players* if the design investments cost 40,000L.E. and the expenses to produce each unit are 20 L.E. Calculate the unit cost of this *mp3 player*.
2. Determine the Carry, Zero, Negative, and Overflow flags after the operation  $E3h + 2Fh$ .
3. Show how to connect a push button switch using pull down resistance to a microcontroller.
4. A certain system has a memory size of 16 K memory words. Determine the minimum number of lines required for the address bus.

*Good Luck,  
Dr. Ahmad El-Banna*