

**DESIGNING WITH PROCESSORS AND CONTROLLERS  
(ECEN 3222)**

**Time Allotted : 3 hrs**

**Full Marks : 70**

*Figures out of the right margin indicate full marks.*

*Candidates are required to answer Group A and  
any 5 (five) from Group B to E, taking at least one from each group.*

*Candidates are required to give answer in their own words as far as practicable.*

**Group - A  
(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) Three key technologies used for embedded systems are processor technology, design technology and  
(a) system (b) IC (c) gaming (d) computer.
- (ii) Which is not an embedded processor?  
(a) ARM 7 (b) ARM 9 (c) AMD 29050 (d) IBM 370.
- (iii) DMA can be used to transfer data directly between memory and a  
(a) Peripheral unit (b) flip flop (c) counter (d) register.
- (iv) An RTOS shall always have  
(a) time sensitive response (b) use of virtual memory  
(c) non deterministic output (d) high interrupt latency.
- (v) How many separate address and data lines are needed for a RAM memory 16K × 8?  
(a) 10 addresses, 16 data lines (b) 14 addresses, 8 data lines  
(c) 12 addresses, 16 data lines (d) 12 addresses, 12 data lines.
- (vi) Property which does not characterize an embedded system is  
(a) random output (b) real time output  
(c) low manufacturing cost (d) low power consumption.
- (vii) An RTOS shall always have  
(a) time sensitive response (b) use of virtual memory  
(c) non-deterministic output (d) high interrupt latency.
- (viii) What is the basic feature of PAL?  
(a) Only AND array is programmable  
(b) Only OR array is programmable  
(c) Both AND and OR arrays are programmable  
(d) None of the above.

## B.TECH/AEIE/CSE/IT/6<sup>TH</sup> SEM/ECEN 3222/2021

- (ix) A large memory is compressed into a small one by using  
(a) LSI semiconductor (b) VLSI semiconductor  
(c) CDR semiconductor (d) SSI semiconductor.
- (x) The locality of reference justifies the use of  
(a) Flash memory (b) cache memory  
(c) Main memory (d) virtual memory.

### Group - B

2. (a) What are the characteristics of an embedded system?  
(b) What are the design-metrics normally optimized to meet the design challenges of an embedded system?  
(c) Illustrate the basic steps for design of a common single purpose processor design.  
**3 + 3 + 6 = 12**
3. (a) State differences between  
(i) RISC and CISC architecture  
(ii) Von-Neumann and Harvard architecture.  
(b) What is the working principle of a general PLD and hence derive the general structure of a typical PLD.  
**(4 + 4) + 4 = 12**

### Group - C

4. (a) Explain use of each control bit of I<sup>2</sup>C bus protocol.  
(b) Compare the advantages and disadvantages of data transfer using serial and parallel ports/devices.  
**6 + 6 = 12**
5. (a) Explain the application of watchdog timer with a clear practical example.  
(b) Describe using suitable diagram the flow of operation of interrupt driven I/O using fixed ISR location.  
**6 + 6 = 12**

### Group - D

6. (a) Explain the read write mechanism in an EPROM with diagram.  
(b) What are the differences between “memory mapped I/O” and “standard I/O”.  
**6 + 6 = 12**
7. (a) State what are the different hardware software co design issues and how they are met.

- (b) Explain briefly ARM processor architecture and memory organization with block schematic.

**8 + 4 = 12**

**Group - E**

8. (a) Explain with examples what is a real time system? What are differences between a RTOS and a GPOS?

- (b) Explain Real Time classification as “hard”, “firm” and “soft” with examples. Where would one categorize the “Automatic Flight Control of Airplane”.

**6 + 6 = 12**

9. (a) State the principle of operation of a “keypad controller” with proper diagram.

- (b) Write short notes on “wireless devices”.

**6 + 6 = 12**

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