2012 - 2013
B.TECH. AUTUMN (V SEMESTER) EXAMINATION
(COMPUTER ENGINEERING)
MICROPROCESSORS THEORY AND APPLICATIONS
(CO – 301)
Credits: 05

Maximum Marks : 60
Duration : Three Hours

Note: Answer all questions. Comment your programs insightfully. Assume suitably wherever required.

1. (a) List the steps involved in communication between the microprocessor and the peripheral devices. List and explain the pins of 8085 that are used in memory mapped I/O operation.

(b) (i) Load 2737H in register pair HL in two ways: using LXI, and using MVI instruction.

(ii) Byte F7H is at location 2050H. Transfer this byte from memory to accumulator in three ways: using MOV, using LDAX, and using LDA.

OR

1'. (a) List the six groups in which pins of 8085 are divided. Draw the pin out diagram showing pins of each group.

(b) Two five-byte hex members are stored in memory. The first member is stored at locations 2051H through 2055H through 2075H, and the second at locations 2071H through 2075H with MSB at the highest address. Write a program to add the two members and store the result at location 2051H through 2056H, with MSB at the highest address.

2. (a) Differentiate between I/O mapped I/O and memory mapped I/O.

(b) What do you mean by absolute address decoding and partial address decoding? What is the problem that might occur in partial decoding? Can input front and output front have the same port address? Give reason.

3. (a) Discuss PUSH and POP instructions. Explain how a stack is used during subroutine call and return.

(b) Discuss the DMA data transfer scheme, and explain its various formats.

OR

Contd.....2
3'. (a) Discuss various 8085 vectored interrupts. What do you mean by vectoring of interrupts? Name the non-vectored interrupt.

(b) Explain the RST instructions of 8085. Discuss how interrupts are handled through RST instructions.

4. (a) What is a microcontroller, and how is it different from a microprocessor? Explain at least three applications where microcontroller is used. Name three 8-bit microcontrollers.

(b) Discuss the PIC microcontroller in detail.

5. (a) Explain the programming model of 8086. Briefly explain the purpose of the various types of registers of 8086.

(b) Explain what is memory segmentation and how address are generated in 8086. With the help of very small figures explain base-plus-index and register-relative addressing modes of 8086.

(c) Write a short technical note on the advanced features of 80386 as compared to 8086.
Attempt all questions
Symbols have their usual meanings
Assume appropriate data if missing

1(a) Briefly explain the characteristics of software that distinguish it from other classical engineering products (6)

1(b) What is the role of a common process framework when defining a software process? Explain with the help of a diagram (6)

OR

1'(a) What is software quality assurance (SQA)? List some of the SQA activities. (6)

1'(b) Draw a diagram showing the working of the Spiral process model. What are the drawbacks of this model? (6)

2(a) What is an "indicator" when measuring software? Briefly explain the different kinds of indicators. (6)

2(b) Explain the two most important activities when planning a software project? (6)

OR

2'. Explain the COCOMO model for software cost estimation. Is the Make-Buy decision a part of this model? (12)

3(a) What is an analysis model? Draw a diagram showing the flow of information from the analysis model to the design model (6)

3(b) What are the benefits of adapting a modular design methodology when developing software? List the five criteria suggested by Meyer that enable us to evaluate a design method for its modularity (6)
3'(a) Justify why coupling is an undesirable trait during modular design. Which is the worst form of coupling and why?

3'(b) Explain the concept of structured design methodology. What are the benefits of adopting this methodology when designing software?

4(a) List and very briefly explain some of the programming practices suggested with the objective of writing simple and clear code.

4(b) Explain the method of measuring the cyclomatic complexity of a program with the help of a suitable example.

5(a) Briefly discuss the user-interface design process.

5(b) Draw the diagram of the software re-engineering process model and explain the "reverse engineering" step within it.
2012-2013
B. TECH (AUTUMN V SEMESTER) EXAMINATION
(COMPUTER ENGINEERING)
OPERATING SYSTEMS (CO-303)
CREDITS: 05

MAXIMUM MARKS: 60 DURATION: THREE HOURS

NOTE: Attempt All Questions. Make relevant assumptions wherever required.

1. Attempt any two parts.
   (a) What is spooling? Why operating systems evolved from simple batch systems to multi-
       programmed batch systems and then to multitasking systems?
   (b) Compare modular and micro kernel approach to OS design discussing their advantages and
       disadvantages.
   (c) List and explain four services provided by the operating system that are designed to make
       it more convenient for users to use the computer system. Also explain how these services
       are used by the application programmers?

2. Attempt any two parts.
   (a) Explain what are the issues in indirect naming of message-passing systems? Also discuss
       message-passing facility of Windows XP.
   (b) In a multiprogramming environment, three processes P1, P2 and P3 are to be run. Each
       process receives some input, processes it and produces an output. This cycle is repeated
       until final output has been produced. A preemptive priority algorithm is to be used. Using
       the following data, draw Gantt chart and calculate turnaround time and waiting time for
       each process.

<table>
<thead>
<tr>
<th>Process</th>
<th>Priority</th>
<th>Arrival time</th>
<th>Time to input</th>
<th>Processing time</th>
<th>Time to output</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>3 (Low)</td>
<td>1</td>
<td>10</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>P2</td>
<td>1 (High)</td>
<td>3</td>
<td>6</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>P3</td>
<td>2</td>
<td>0</td>
<td>11</td>
<td>6</td>
<td>5</td>
</tr>
</tbody>
</table>

   (c) What are threads? Discuss any two threading issues. Provide two programming examples
       in which multithreading does not provide better solution than single threaded solution.

3. Attempt any two parts.
   (a) Explain Progress and Bounded Waiting requirements that a solution to critical section
       problem should satisfies. Two arch enemies like to eat at some restaurant but they prefer to
       eat when their enemy is not there. Write code to synchronize their access to the restaurant.
       The code should also satisfy the bounded waiting and progress requirement.
   (b) What does the term busy waiting mean? Discuss another technique that could be used to
       avoid busy waiting. Then compare and contrast these two methods discussing their
       advantages and disadvantages.
   (c) What are the four characteristics of deadlock? Considering the deadlock situation in the
       dining philosopher problem, discuss how deadlock could be avoided using deadlock
       prevention methods by eliminating each of the four conditions.
4 Attempt any two parts.

(a) How memory access time is improved in paging? Explain it using a suitable diagram.

(b) What is Belady’s anomaly? For each of the following page replacement algorithms, describe a case using a suitable example where the algorithm does a poor job in scheduling memory: LRU, LFU, FIFO.

(c) Design a memory mapping scheme in which logical address has segments that are paged. The machine has a 64-bit virtual address. Each process can have up to 64K segments, and page size is 64K bytes. The segment tables and page tables are stored in main memory. Each segment table entry points to a page table. Each page table entry points to a page in real memory. Each page table entry will also have a read/write bit and a reference bit. This machine will support physical memories up to 64 gigabytes.

1. Draw a diagram of this memory map. Show how the pieces of the virtual address are used to reference each of the tables, and to generate the physical address. Indicate the size of each field, where it comes from, and where it is used. Also indicate where page faults or memory protection traps will be indicated.

2. How large (in bytes) is a full-sized segment table?

3. What happens if we double the page size (while still keeping a 64 bit virtual address)?

5(a) What data structures are required to store and access a file and how are they used?

(b) Explain following file block allocation methods-
   (a) Linked  (b) Contiguous

(c) Explain the Linux process scheduling method in brief.
B. TECH (AUTUMN SEMESTER) EXAMINATION
(COMPUTER ENGINEERING)
DATABASE MANAGEMENT SYSTEMS
(CO-304)

CREDITS: 05

MAXIMUM MARKS: 60
DURATION: THREE HOURS

NOTE: Attempt All Questions. Make relevant assumptions wherever required.

1 Attempt any two parts.
   (a) What are the major components of the database management system software? Explain with a suitable diagram.
   (b) What is a database system? What are its main advantages?
   (c) What are advantages of B+ Tree over B Tree? For the following values, Construct a B+-tree of order of internal and leaf node as 3 and 2 respectively.

8, 5, 1, 7, 3, 12, 9

2 Attempt any two parts.
   (a) What is a relation? What are its properties? Explain the concept of Foreign Keys with a suitable example.
   (b) Explain the syntax of SQL SELECT statement. Write equivalent SQL statements for the following relational algebra operators (assume suitable data).

Join, DivideBy

(c) What is integrity of database? What are different types of integrity constraints? Explain each with example.

3 Attempt any two parts.
   (b) Relation R(A,B,C,D,E) satisfies B → E, AB → C, C → AD. Convert it into BCNF.
   (c) What is normalization? What are its advantages? Explain using a suitable example.

4 Attempt any two parts.
   (a) What are three concurrency control problems? How are they solved? Explain.
   (b) Explain the checkpoint mechanism used for system recovery using a suitable example.
   (c) What is the role of System log in recovery? What information is recorded in it?

5(a) What are distributed databases? Write and explain any four of its characteristics.
(b) What is a data warehouse? What types of schema are used in data warehouses?
2012-2013
AUTUMN Vth SEMESTER B.TECH EXAMINATION
(Computer Enng.)
DIGITAL ELECTRONICS (CO-308)
Credit-04

Max. Marks: 60

Time: 3 hrs.

Note:
—Parts (a) & (b) of each question are compulsory. Attempt either part (c) or (c').
—Symbols & notations used have their standard meanings.
—Assume suitable data if required.

1. (a) What are the advantages of using an IC? How to choose a logic style?
   (b) What is fan-out? How does a CMOS circuit work as a bilateral switch?
   (c) Explain Totem-Pole arrangement with the help of a proper TTL circuit.
   OR
   (c') The data sheet of TTL-74LS series is given below:
   \[ V_{OH} (\text{min}) = 2.7 \text{ V} , \quad V_{OL} (\text{max}) = 0.5 \text{ V} , \quad V_{IH} (\text{min}) = 2.0 \text{ V} , \quad V_{IL} (\text{max}) = 0.8 \text{ V} \]
   Calculate the DC noise margins for a typical IC. Implement the circuit in CMOS technology with
   minimum number of transistors that realizes the function \( F = \overline{AB} + \overline{C(D+E)} \).

2. (a) Compare ROM, PROM, EPROM and EEPROM.
   (b) Differentiate between PLA and PAL. Why is DRAM slower than SRAM?
   (c) Briefly discuss about ROM timing with a suitable diagram. What is flash memory?
   OR
   (c') Draw the architecture of a 64x4 RAM. What are the minimum numbers of pin required to
   represent this memory chip?

3. (a) What are the basic differences between static logic circuits and dynamic logic circuits?
   (b) Write a short note on CCD.
   (c) Explain the cascading problem in dynamic logic circuits. How does domino logic overcome
   that problem?
   OR
   (c') Design the structure of a 1T-DRAM cell and describe its working procedure. Draw the circuit
   of a 4-to-1 column decoder.

4. (a) What does resolution mean for a DAC? What is the advantage of a smaller resolution?
   (b) What is the function of a transducer? What is the largest value of output voltage from an 8-bit
   DAC that produces 1.0 V for a digital input of 00110010?
   (c) Describe the basic operation of a digital ramp ADC? Explain quantization error? How can it
   be reduced in a digital ramp ADC?
   OR
   (c') Describe the steps in a computer data acquisition process. How many comparators and
   resistors would a 12-bit flash converter require?
2012-13
B. TECH. AUTUMN (V SEMESTER) EXAMINATION
(COMPUTER)
EL-340: COMMUNICATION ENGINEERING
Credits = 4  Maximum Marks: 60  Duration: Three Hours

Note: Answer all the questions. Make suitable assumptions wherever necessary.

1. (a). Verify that the message signal is recovered from a modulated DSBSC signal by first multiplying it by a local sinusoidal carrier and then passing the resultant signal through a lowpass filter, (i) in the time domain and (ii) in the frequency domain.

(b). A sinusoidal signal of 3 KHz and peak amplitude of 15 volts generates an AM signal by modulating a carrier of 10-MHz. The modulation index of the resultant AM wave is 60%. Plot the amplitude spectrum of the AM wave.

OR

(b'). Show that AM is a linear modulation whereas FM is a nonlinear modulation.

(c). Discuss briefly, how different voice signals are multiplexed using FDM in telephone system.

OR

(c'). Briefly explain the working of a superheterodyne radio receiver.

2. (a). Discuss briefly, how to reconstruct the analog signal \( g(t) \) from the sequence of its sample values \( \{g[nT_s]\} \).

OR

(a'). A 1 kHz signal is flat-top sampled at the rate of 1800 samples/sec and the samples are applied to an ideal LPF with cutoff frequency of 1100 Hz. Determine the frequency contents of the signal at the output of the filter.

(b). Consider a uniform quantizer of mid-tread type. Assume that a Gaussian-distributed random variable with zero mean and unit variance is applied to this quantizer input. Assume that the amplitude of the input lies in the range of -4 to +4. Calculate the output signal-to-noise ratio of the quantizer.

OR

(b'). Briefly explain what is meant by companding. What advantage does companded PCM have over linear PCM for telephone communication?

(c). Given the data stream 1110010100, sketch the transmitted sequence of pulses for each of the following line code: Polar RZ, Bipolar RZ, and Manchester code.
3. (a). Assume that a data stream of 1Mbps is to be QPSK modulated on an RF carrier. What is the first null bandwidth of the RF spectrum, if simple rectangular pulses are used? And what is the absolute bandwidth, if raised cosine pulses with roll off factor of 0.3 are used.

(b). In the on-off keying version of an ASK system, symbol ‘1’ is represented by transmitting a sinusoidal carrier of amplitude $\sqrt{2E_b/T_b}$, where $E_b$ is the bit energy and $T_b$ is the bit duration. Symbol ‘0’ is represented by switching off the carrier. Assume that both the symbols occur with equal probability. Determine the average probability of error for coherent reception of this ASK signal in an AWGN channel.

(c). Discuss how in linear M-ary modulation schemes, increasing the value of M increases the bandwidth efficiency as well as the bit error rate.

4. (a). A discrete memory less source has four symbols with probabilities 0.5, 0.25, 0.125, and 0.125. Construct a Huffman code for the source and calculate its efficiency.

(b). An analog signal having 4 kHz bandwidth is sampled at 1.25 times the Nyquist rate, and each sample quantized into one of 256 equally likely levels. The output of this source is transmitted over an AWGN channel with a bandwidth of 10 kHz. Find the S/N ratio required for error-free transmission over this channel.

(c). Discuss briefly, the important features of cellular mobile system.

OR

(c'). Discuss briefly, the advantages of CDMA access techniques for mobile system.
Answer ALL the questions. Notations used have their usual meaning.

1(a) Explain the difference between orientational, electronic and ionic polarizations in brief.

(b) Define static dielectric constant and obtain the relation \( P = \varepsilon_0 (\varepsilon_r - 1) E \).

(c) What is piezoelectricity? Give two examples of piezoelectric materials. Draw hysteresis curve for ferroelectric material and discuss it briefly.

OR

(c') The electronic polarizability of the Ar atom is \( 1.8 \times 10^{-39} \text{ F.m}^2 \). What is the static dielectric constant of Ar gas at 1 atmospheric pressure at room temperature (300K)? [Given: \( k_B = 1.38 \times 10^{-23} \text{ J/K} \) and \( \varepsilon_0 = 8.854 \times 10^{-12} \text{ F/m} \)]

2(a) What is dipolar relaxation? Obtain the relation for orientational polarization in alternating fields.

(b) Explain the diffusion process in semiconductors and find a relation for diffusion current per unit area for \( n \) and \( p \) type semiconductors.

(c) An intrinsic Si sample is doped with donors from one side such that \( N_d = N_c \exp(-ax) \).

(i) Find an expression for \( E(x) \) at equilibrium over the range for which \( N_d >> n_i \).

(ii) Evaluate \( E(x) \) when \( a = 4 \text{ (\mu m)}^{-1} \).

3(a) How ferromagnetism is explained on the basis of exchange interaction? Give a brief account of Weiss theory of ferromagnetism.

(b) The magnetic field in a diamagnetic material is 1000 Am^{-1}. Calculate the magnetization and flux density of the material if its susceptibility is \(-0.4 \times 10^{-5}\).

(c) Distinguish between hard and soft magnetic materials. Give two examples for each.

Continued......2
4(a) Derive the London's equations and explain the term coherence length.

(b) A d.c. voltage of $1\mu$V is applied across a Josephson junction. Calculate the frequency of the Josephson current generated. [Given: $h = 6.63 \times 10^{-34}$ J.s]

(c) Discuss briefly the potential applications of superconductors.

OR

4(a') Explain d.c. Josephson effect. Show that the supercurrent of superconducting pairs across the junction depends on the phase difference.

(b') A superconductor sample has a critical temperature of 3.722 K in zero magnetic field of 0.0305 T at 0 K. Evaluate the critical field at 2 K

(c') Discuss the thermodynamics of superconducting transition in detail.