2017-18
B.TECH. (AUTUMN SEMESTER) EXAMINATION
COMPUTER ENGINEERING
DIGITAL ELECTRONICS
CO-308

Maximum Marks: 60 Credits: 04 Duration: Two Hours

Answer all the questions. Assume suitable data if missing. Notations used have their usual meaning.

<table>
<thead>
<tr>
<th>Q.No.</th>
<th>Question</th>
<th>M.M.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1(a)</td>
<td>What are the advantages and limitations of pass transistor logic circuits? How the limitations are overcome?</td>
<td>[04]</td>
</tr>
<tr>
<td>1(b)</td>
<td>Discuss the different types of ROMs. How the disadvantages of EPROM are overcome by EEPROM?</td>
<td>[06]</td>
</tr>
<tr>
<td>1(c)</td>
<td>Implement 8x1 MUX using PTL circuit.</td>
<td>[05]</td>
</tr>
<tr>
<td>2(a)</td>
<td>Explain the read and write operations in a 6 transistors based SRAM cell using suitable diagrams. Why is DRAM slower than SRAM?</td>
<td>[07]</td>
</tr>
<tr>
<td>2(b)</td>
<td>Compare PLA and PAL. Show how a PLA can be used to implement BCD to Excess-3 Code converter.</td>
<td>[4+4]</td>
</tr>
<tr>
<td>2(b')</td>
<td>A dynamic RAM has a memory cycle time of 64 nsec. It has to be refreshed 100 times per msec and each refresh takes 100 nsec. What percentage of the memory cycle time is used for refreshing?</td>
<td>[08]</td>
</tr>
<tr>
<td>3(a)</td>
<td>Briefly explain CCD. With help of diagram show the working of two phase CCD.</td>
<td>[3+4]</td>
</tr>
</tbody>
</table>

...Contd.>
3(b) What is monotonicity? Briefly explain the issues with cascading dynamic gates and solution of these problems.

OR

3(b') Explain Dynamic CMOS shift register with timing diagram.

4(a) Explain the operation of a Successive Approximation ADC with the help of diagram and flowchart. Draw the waveform for $V_{AX}$ as the SAC with a resolution of 1V converts $V_A = 6.7$ V.

OR

4(a') Explain the conversion of a 4-bit digital value into a proportional analog value through an inverting R-2R ladder DAC. What should be the value of feedback resistor $R_f$ for a step size of 0.5 V in a 4-bit binary weighted resistors DAC? ($V_{ref} = 5$ V)

4(b) Write short notes on any Two topics:
   a) Data Acquisition process of Digital Systems.
   b) ECL Logic family
   c) Flash ADC
   d) DAC Specifications
Maximum Marks: 60  
Credits: 04  
Duration: Two Hours

Attempt all the questions. Assume suitable data if missing. Notations used have their usual meaning.

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</tr>
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<tbody>
<tr>
<td>1(a)</td>
<td>List five differences between Complex Instruction Set Computer (CISC) and Reduced Instruction Set Computer (RISC).</td>
<td>[05]</td>
</tr>
<tr>
<td>1(b)</td>
<td>Name the addressing modes in 8085 and give one example of each.</td>
<td>[05]</td>
</tr>
<tr>
<td>1(c)</td>
<td>In the context of 8085 microprocessor differentiate between I/O mapped I/O, and memory mapped I/O.</td>
<td>[05]</td>
</tr>
<tr>
<td><strong>OR</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1'(a)</td>
<td>Draw circuit diagram to generate $MEMR$, $MEMW$, $IOR$, and $IOW$ signals from the $RD$, $WR$, and $I/O/\overline{M}$ signals of 8085 microprocessor.</td>
<td>[05]</td>
</tr>
<tr>
<td>1'(b)</td>
<td>Draw block diagram of a simplified (a) Hardware model and (b) Programming model of 8085 microprocessor.</td>
<td>[05]</td>
</tr>
<tr>
<td>1'(c)</td>
<td>List and briefly explain 8085 interrupt signals. What are the priorities of these interrupt signals?</td>
<td>[05]</td>
</tr>
</tbody>
</table>

2(a) The following 8085 instruction is executed:

**IN 03H**

(i) Draw the timing diagrams for execution of the instruction. The instruction is stored at memory address $2040H$ onwards.

(ii) Find out the execution time for Opcode Fetch cycle, Memory Read machine cycle, I/O Read machine cycle, and the Instruction cycle. Clock frequency $f = 2$ MHz.
2(b) A memory chip of unknown size (*uKx8*) is interfaced with 8085 microprocessor. The memory address of this chip ranges from 8800H to 8FFFH.

Find out

(i) The size of the memory chip i.e. the value of *u*, and
(ii) The number of address lines required for this memory chip.

Further, design an address decoding circuitry to generate chip select signal for this memory chip.

3(a) Assume that 8086 mainline program is in execution and an interrupt request arrives. Explain the interrupt processing details in the mainline program and the interrupt service routine details.

Beginning at what 20-bit real address, the interrupt vector number 21H is stored in the memory for 8086 microprocessor?

Given the following values of memory locations, what will be the new program (ISR) address (CS:IP) if an INT 21H is executed?

<table>
<thead>
<tr>
<th>Memory address</th>
<th>Data Stored</th>
</tr>
</thead>
<tbody>
<tr>
<td>00088H</td>
<td>F5H</td>
</tr>
<tr>
<td>00087H</td>
<td>FFH</td>
</tr>
<tr>
<td>00086H</td>
<td>FFH</td>
</tr>
<tr>
<td>00085H</td>
<td>00H</td>
</tr>
<tr>
<td>00084H</td>
<td>00H</td>
</tr>
<tr>
<td>00083H</td>
<td>01H</td>
</tr>
<tr>
<td>00082H</td>
<td>02H</td>
</tr>
<tr>
<td>00081H</td>
<td>10H</td>
</tr>
<tr>
<td>00080H</td>
<td>00H</td>
</tr>
<tr>
<td>0007FH</td>
<td>FFH</td>
</tr>
</tbody>
</table>

3(b) What will be the content of the registers BX, DI, SP, and the memory locations at offset address 03FFH, 200AH, and 200BH in the data segment after the execution of the following program

```assembly
MOV AX, 5000H
MOV DS, AX
MOV SS, AX
MOV BX, 2000H
MOV SP, 0400H
MOV [BX+10], BX
PUSH AX
PUSH BX
POP DI
```

i.e. \(BX = ?\) \(DI = ?\) \(SP = ?\) \((DS:03FF) = ?\) \((DS:200A) = ?\) \((DS:200B) = ?\)

**contd...**
| OR |  
|---|---|
| **3(b')** | Write an assembly language program (8085 or 8086) to add 5 numbers (two digit BCD) stored in an array called BCD. Use one of the registers as a counter. Store the results in memory. |
| **4(a)** | Explain the function of Programmable Timer / Counter 8253/8254. How can it be used with a Priority Interrupt Controller 8259 to realise a real-time clock? |
| **OR** |  
| **4(a')** | The Programmable Peripheral Interface 8255 is operating in mode 0, with Port A as output Port and Port B as input port. 8 LEDs are connected to Port A through buffer. The corresponding LED becomes ON (glow) when ‘1’ is output to any bit of port A. Two switches SW1 and SW2 are connected to bit 1 and bit 2 of Port B. If a switch is ON a value of ‘1’ is present on the relevant bit of port B. Address of Port A is 00H, address of Port B is 01H and address of Control Port is 03H. Write an assembly language program (8085 or 8086) that senses the switches. If SW1 is ON, LEDs on PA7 – PA4 should glow. If SW2 is ON, LEDs on PA3 – PA0 should glow. |
| **4(b)** | Name the general purpose registers of 8086. Explain the concept of physical address and logical address with the help of segment registers and offset registers in 8086. |
Answer all the questions.
Assume suitable data if missing.
Notations used have their usual meanings.

Q.No | Question | MM
---|---|---
1(a) | With the help of an appropriate diagram, describe the services provided by an operating system. | [7]

OR

(a') | Draw a diagram of the states of a process. How a context switch is carried out from one process to another process? | [7]

(b) | With the help of suitable diagrams, describe the structures of the following operating systems used in smart phones: (i) iOS, and (ii) Android. | [8]

2(a) | Consider the following solution to the critical section problem called Peterson's solution. It is restricted to two processes that alternate execution between their critical sections and remainder sections. The processes are numbered P_0 and P_1. For convenience, when presenting P_i we use P_j to denote the other process; that is, j equals 1 - i. Peterson's solution requires the two processes to share two data items:

```c
int turn;
boolean flag[2];
```

The variable `turn` indicates whose turn it is to enter its critical section. That is, if `turn == i`, then process `P_i` is allowed to execute in its critical section.

```c
do {
    flag[i] = true;
    turn = j;
    while (flag[j] && turn == j):
        critical section
    flag[i] = false;
    remainder section
} while (true);
```

Show that Peterson's solution is correct.

OR

(a') | What is a critical section problem? Describe the requirements that are to be satisfied by a solution to the critical section problem? | [7]

(b) | What is a monitor? Describe a solution to the dining philosophers problem using monitors. | [8]

3(a) | With the help of a suitable diagram, describe multilevel feedback queue scheduling algorithm. | [7]
(b) Consider the following four processes, with the length of the CPU burst given in milliseconds:

<table>
<thead>
<tr>
<th>Process</th>
<th>Arrival Time</th>
<th>Burst Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>P₀</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>P₁</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>P₂</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>P₃</td>
<td>3</td>
<td>5</td>
</tr>
</tbody>
</table>

Draw the Gantt charts and compute the average waiting time and the average turnaround time for the following scheduling algorithms: (i) non-preemptive SJF, and (ii) preemptive SJF.

OR

(b') Consider a preemptive priority scheduling algorithm based on dynamically changing priorities. Larger priority numbers imply higher priority. When a process is waiting for the CPU (in the ready queue, but not running), its priority changes at a rate α. When it is running, its priority changes at a rate β. All processes are given a priority of 0 when they enter the ready queue. The parameters α and β can be set to give many different scheduling algorithms.

(i) What is the algorithm that results from β > α > 0?
(ii) What is the algorithm that results from α < β < 0?

Justify your answer in each case.

4(a) Consider the following snapshot of a system:

```
<table>
<thead>
<tr>
<th>Allocation</th>
<th>Max</th>
<th>Available</th>
</tr>
</thead>
<tbody>
<tr>
<td>P₀</td>
<td>A B C D</td>
<td>A B C D</td>
</tr>
<tr>
<td>P₁</td>
<td>3 0 1 4</td>
<td>5 1 1 7</td>
</tr>
<tr>
<td>P₂</td>
<td>2 2 1 0</td>
<td>3 2 1 1</td>
</tr>
<tr>
<td>P₃</td>
<td>3 1 2 1</td>
<td>3 3 2 1</td>
</tr>
<tr>
<td>P₄</td>
<td>0 5 1 0</td>
<td>4 6 1 2</td>
</tr>
<tr>
<td></td>
<td>4 2 1 2</td>
<td>6 3 2 5</td>
</tr>
</tbody>
</table>
```

Using the banker’s algorithm, determine whether or not the state is safe. If the state is safe, illustrate the order in which the processes may complete. Otherwise, illustrate why the state is unsafe.

(b) Consider the following reference string:

1, 7, 0, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 1, 0.

Let there be three frames, compute the number of page-faults in case of the least recently used (LRU) page replacement policy.

OR

(b') Let there be 200 cylinders in a disk numbered from 0 to 199. Consider a disk queue with requests for I/O to blocks on cylinders 94, 180, 39, 124, 16, 118, 65, 68, in that order. If the disk head is initially at cylinder 55 and is moving towards the cylinder 199, what is the total head movement in case of the SCAN algorithm?
Maximum Marks: 60  
Credits: 04  
Duration: Two Hours

Answer all the questions.  
Assume suitable data if missing.  
Notations and symbols used have their usual meaning.

Q.No.  

1(a) An angle modulated signal has the form \( u(t) = 20 \cdot \cos(2\pi f_c t + 400 \sin 2000\pi t) \), where \( f_c = 10 \) MHz. Determine the average transmitted power, the peak-phase deviation, determine the peak-frequency deviation. Is this an FM or a PM signal? [CO-1]  

OR  

1(a') An angle-modulated signal with carrier frequency \( \omega_c = 2\pi \times 10^6 \) is described by \( \Phi_{EM}(t) = 10 \cdot \cos(\omega_c t + 0.1 \sin 2000\pi t) \). Find the power of the modulated signal, frequency deviation \( \Delta f \) and the phase deviation \( \Delta \Phi \). Also estimate the bandwidth of \( \Phi_{EM}(t) \). [CO-1]  

1(b) The message \( m(t) = 2 \cdot \sin(2000\pi t) - 3 \cdot \cos(4000\pi t) \) is used in an AM system with a modulation index of 70% and carrier frequency of 580 KHz. What is the power efficiency? If the net transmitted power is 10 watts, find the magnitude spectrum of the transmitted signal. [CO-2]  

2(a) It is desired to set up a central station for simultaneous monitoring of the electrocardiograms (ECGs) of 10 patients. The data from the rooms of the 10 patients are brought to a processing center over wires and are sampled, quantized, binary coded, and time-division multiplexed. The multiplexed data are now transmitted to the monitoring. The ECG signal bandwidth is 100 Hz. The maximum acceptable error in sample amplitudes is 0.25% of the peak signal amplitudes. The sampling rate must be at least twice the Nyquist rate. Determine the minimum cable bandwidth needed to transmit these data. [CO-3]  

2(b) Draw and explain the block diagram of Delta modulator. A given delta modulation system operates with a sampling rate \( f_s \) and a fixed step size \( \Delta \). If the input \( m(t) \) to the system is:  

conf'd...2.
\( m(t) = A \tanh(\beta t) \), where \( A \) and \( \beta \) are constant. Determine the minimum step size \( \Delta \) for delta modulation of this signal, which is required to avoid slope overload.

\[
\left[ \frac{d \tanh(\beta t)}{dt} \right] = \beta \text{sech}^2 (\beta t) = \beta \left( \frac{2}{e^{\beta t} + e^{-\beta t}} \right)^2
\]

[CO-5]

OR

2(b') What are the desirable characteristics of a line encoding signaling technique? Consider the sequences: 0010111. Sketch the line encoded waveform for Bipolar RZ signaling and Unipolar RZ signaling. [CO-5]

3(a) Write the expression of a QPSK modulated waveform & explain all the symbols you have used. [CO-2]

OR

3(a') Write the expression of a binary FSK modulated waveform & explain all the symbols you have used. [CO-2]

3(b) Draw and explain the working of the QPSK demodulator. [CO-2]

3(c) What are the performance requirements for digital transmission systems? Discuss the comparison of 8-ary ASK, 8-ary PSK and 8-ary QAM modulation techniques in terms of power efficiency and spectral efficiency considering the same error performance over AWGN channel. [CO-4]

4(a) Consider the random variable

\[ X = \begin{pmatrix} x_1 & x_2 & x_3 & x_4 & x_5 & x_6 & x_7 \\ 0.49 & 0.26 & 0.12 & 0.04 & 0.04 & 0.03 & 0.02 \end{pmatrix} \]

Find a binary Huffman code for \( X \) and expected code length for this encoding. [CO-5]

OR

4(a') Two binary random variables \( X \) and \( Y \) are distributed according to the joint distributions

\( P(X = Y = 0) = P(X = 0, Y = 1) = P(X = Y = 1) = 1/3 \). Compute \( H(X, Y) \) and \( I(X; Y) \). [CO-5]

4(b) Using the generator polynomial \( x^4 + x^3 + 1 \), write the CRC code bits for the message 11100110. [CO-5]

4(c) Derive a fundamental relation between the bandwidth and power efficiency of a communication system for reliable communication? [CO-4]
2017-18
B.TECH. (AUTUMN SEMESTER) EXAMINATION
(ELECTRICAL, CHEMICAL, PETROCHEMICAL, COMPUTER)
ECONOMICS AND MANAGEMENT
ME 340

Maximum Marks: 60

Credits: 04

Duration: Two Hours

Answer all the questions.
Assume suitable data if missing.

1a. With the help of suitable examples, differentiate between the following: [3 each]
   i. Necessities and luxuries.
   ii. Monopoly and oligopoly.

b. The details of the feasibility report of a project are shown below. [6]
   Initial Cost = Rs. 50,00,000
   Life of the project = 20 years
   Annual equivalent revenue = Rs. 15,00,000
   Modernizing cost at the end of the 10th year = Rs. 20,00,000
   Salvage value at the end of project life = Rs. 5,00,000
   Check whether the project is feasible or not using an interest rate of 20%

OR

1'a. What do you understand by economic indicators? Name some indicators and discuss any one of them in detail. [6]

b. Find the capitalized cost of a present cost of $300,000, annual cost of $35,000 and a periodic cost of $75,000 every 5 years. Use an interest rate of 12% per annum. [6]

2. Answer any TWO of the following: [6 each]

   a. Define the terms: challenger and defender.
      Three years ago, a desktop testing machine was purchased for $7,000, and since that time, the resale value has been decreasing at the rate of $1,000 per year. Maintenance & operating costs were $1,600 the first year and have been increasing at the rate of $500 per year for each additional year of service. No exact projections are available, but it appears that both trends should continue for at least the next 3 years. At the end of that time, the equipment could be replaced by another unit with the same cost pattern. However, a new machine with a service life of 10 years is now available for a purchase price of $12,000 and no salvage value. A factory maintenance plan is also available at a fixed cost of $1,500 per year on a contract basis.
      Using a MARR of 25%, determine what replacement policy should be followed by the company if the need for the machine is likely to exist for at least 10 years.

   b. What are the various criteria for performing a cost-benefit analysis?
      Several alternative projects involving water supply systems are under consideration. The associated costs and benefits are as follows:

<table>
<thead>
<tr>
<th>Project</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Cost ($)</td>
<td>2000</td>
<td>100</td>
<td>700</td>
</tr>
<tr>
<td>Operating Cost ($)/year</td>
<td>70</td>
<td>4</td>
<td>60</td>
</tr>
<tr>
<td>Recreation Benefits ($) /year</td>
<td>150</td>
<td>0</td>
<td>55</td>
</tr>
<tr>
<td>Increase in agricultural production ($) /year</td>
<td>200</td>
<td>30</td>
<td>50</td>
</tr>
</tbody>
</table>

Cont'd...
All costs are given in thousands of dollars, and negligible salvage value is assumed at the end of a 50 year life. Which project would you recommend on the basis of a cost-benefit analysis and why? Use an interest rate of 10%.

c. Define the terms: Depreciation and Book Value.
   A machine was purchased of $50,000 and placed in service. It has an estimated market value of $10,000 at the end of its useful life of 15 years. Compute the depreciation amount in the fourth year and the book value at the end of six years by using (a) straight line method
   (b) Double Declining Balance method.

3a. What is the role of information in manager's job? Explain it by using manager as information processor flowchart? Also, list the characteristics of useful information.

b. Discuss the following:
   i. Intuition and Escalation of Commitment
   ii. Delphi and Nominal Groups for decision making

4. Answer any two of the followings:

   a. What do you understand by organizational planning? Discuss the strategic, tactical and operational plans with the help of suitable example.
   b. What is the importance of employee motivation? Explain the Maslow's theory of motivation with the help of suitable example.
   c. What are the benefits and limitations of job specialization? Differentiate between job rotation and job enlargement.

5a. Discuss any two of the following:
   i. Q/R Inventory System
   ii. Quality Control Tools (any two)
   iii. Levels of International Business

b. The starting point of attracting human resources is planning. What procedure do the human resource managers adopt while planning for human resources? How are the forecast and human resource demand and supply matched? Explain.