2015-16
B.TECH. (AUTUMN SEMESTER) EXAMINATION
COMPUTER ENGINEERING
DATABASE MANAGEMENT SYSTEM
CO-304

Maximum Marks: 60  Credits: 05  Duration: Three Hours

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

Q.No  Question  MM

1  Attempt any two parts.
   (a) What is a database system? What are its main advantages?  [7.5]
   (b) What is a data model? What are the different types of data models? Explain each. How these data models are used at different levels of ANSI/SPARC architecture?  [7.5]
   (c) What are the components of a typical DBMS? Explain with the help of a suitable diagram.  [7.5]

2  Attempt any two parts.
   (a) What is a relation? What are its properties? Explain the concept of Foreign Keys with a suitable example.  [7.5]
   (b) What is integrity of database? What are different types of integrity constraints? Explain each with example.  [7.5]
   (c) Write complete syntax of SQL INSERT, DELETE and UPDATE statements.  [7.5]

3  Attempt any two parts.
   (a) What is normalization? What are its advantages? Explain using a suitable example.  [7.5]
   (b) Explain the checkpoint mechanism used for system recovery using a suitable example.  [7.5]
   (c) What are three concurrency control problems? How are they solved? Explain.  [7.5]

4  Attempt any two parts.
   (a) Discuss the steps in query optimization in detail. Why SQL queries are converted into query tree before optimization is done?  [7.5]
   (b) Differentiate between mandatory and discretionary access control mechanisms. Discuss simple security and star properties of mandatory access control method.  [7.5]
   (c) What are distributed databases? Write and explain any four of its characteristics.  [7.5]
Maximum Marks: 60

- Attempt All questions.
- Symbols and notation used have their standard meanings.
- Assume suitable data if required.

1(a) A 4-input TTL NAND gate had to derive some other gate of same TTL family. The on resistance of the pull-down transistor of the totem pole output of the NAND gate is 30 \( \Omega \) and \( V_{OL(max)} \) is 1.25 V and \( V_{OL(min)} \) is 1.5V. Find the maximum number of TTL input that can be connected at the output of NAND gate, if the \( I_h \) and \( I_l \) are 10 \( \mu A \) and 5 mA respectively.

OR

(a') Implement the function \( \bar{f} = (A\bar{B} + D)C \) in CMOS logic and show that that the static power consumption is zero.

(b) Determine the \( W/L \) ratio of the transistors used to implement the logic function \( \bar{f} = AB + C \) in CMOS. Assume that for the basic inverter \( (W/L)_I = 2 \) and \( (W/L)_P = 5 \) and the channel length is 20nm.

2.(a) How the address multiplexing is done in DRAM? In a system, a capacity of 8K X 8 memory is required but PROM chips available are of capacity 2K X 1. How these PROM chips can be used to obtain the required capacity?

OR

(a) Design a MOS NOR ROM that can store the value of mathematical function \( y = x^2 - 3 \), where \( x \) is two-bit number. What is the default value of pseudo NMOS NOR ROM?

(b) Draw the logic circuit of a 3-input PLD which is programmed to function as a Full Adder

OR

(b') What is the main disadvantage of EPROM? How it can be overcome by EEPROM and how it is made possible in the EEPROM to Electrically erase and reprogram the Data?

3.(a) Explain the operation of the Circuit shown in figure (1) with the timing diagram, where \( \Phi_1 \) and \( \Phi_2 \) are the two phase non-overlapping clocks. Is it a ratioed logic or ratioless logic? How this module can be used to construct a cell of a shift register?

Contd.....2.
(b) Use dynamic CMOS logic to implement the function \( f = (A\bar{B} + B)C \) OR

(b') Why dynamic logic gates cannot be cascaded? What is done to cascade them?

4(a). Design and sketch 4-bit \( R_{2R} \) Ladder DAC that drain a constant current from \( V_R \) and give an analog output of 0.5 volt for a digital input of 0010. Determine its percentage resolution.

(b) For each of the following, indicate which type of ADC is being described
   i) Fastest method of conversion.
   ii) Need of Start pulse.
   iii) Require most circuitry
   iv) Does not uses DAC
   v) Uses counter that is never reset to 0.
   vi) Uses large number of comparator.
   vii) Uses a VCO
   viii) Uses capacitor.

(c) Design the circuit of 4-bit binary weighted DAC such that FS reading of DAC is 7 Volt by selecting appropriate values of feedback and input resistance and the DAC input voltage.
Answer all the questions. Assume suitable data if missing. Notations used have their usual meaning.

Q.No.   Question                                                                                                    M.M.
1(a)   Name the addressing modes in 8085 and give one example of each.                                                 [05]
1(b)   Write an assembly language program in 8085 to divide a number by 4.                                               [05]
1(c)   Explain the working of the following instruction with the help of timing diagram in 8085:  
        MVI Reg., Data                                                                                                    [05]
2(a)   With the help of a suitable diagram, explain memory and I/O interfacing in 8085.                                 [05]
2(b)   Write a program in 8085 to realise the following situation: the microprocessor is in an indefinite loop. An 
        interrupt is generated by applying a rising pulse RST 7.5 on terminal manually. The task of the interrupt 
        service subroutine is to add two 8-bit numbers.                                                                  [05]
2(c)   The Programmable Counter/Interval Timer 8253 is operating in Mode 0. Write a program in 8085 to 
        generate interrupt on terminal count. The task of the interrupt service subroutine is to add two 8-bit 
        numbers.                                                                                                           [05]
3(a)   Generate a Delay Subroutine using two registers B & C individually. Write the assembly language code in 8085, 
        states of instructions and calculate the delay for B=FF H and C=FF 11.                                             [05]
3(b)   Show the interfacing of Programmable Peripheral Interface 8255 to 7-segment Decoder/Driver 74L548 and draw the 
        functional table.                                                                                                  [05]
3(e) Draw and explain the pin diagram of programmable DMA controller 8257.

3'(a) Generate a Delay Subroutine using register pair DF. Write the assembly language code in 8085, states of instructions and calculate the delay for DF=HFFH.

3'(b) Write an assembly language program in 8085 beginning at address 2400H to display numbers from 0 to 9 on the 7-segment display. Show the control word of 8255 to interface port B to the decoder/driver. Data stored at memory locations is as follows.
2500—0A, 2501—00, 2502—01, 2503—02, 2504—03, 2505—04, 2506—05, 2507—06, 2508—07, 2509—08, 250A—09.

3'(c) Draw and explain the pin diagram of Programmable Interrupt Controller 8259.

4(a) Draw the high-level block diagram of Pentium Processor, explaining the role of various components.

4(b) Compare the CISC and RISC processor design strategies with the help of suitable example.

4(c) Distinguish between microprocessor, microcontroller and coprocessor giving one example of each.

OR

4'(a) With the help of a suitable diagram, show how the concept of pipelining is used in 8086 microprocessor. Show the speed-up achieved.

4'(b) With the help of a diagram show the 8086 programming registers, highlighting compatibility with the 8083 registers.

4'(c) What do you understand by hyper threading technology? How has it helped in the evolution of the processor architecture?
Answer all the questions. Assume suitable data if missing. Notations used have their usual meaning.

QNo | Question | MM
---|---|---
1  | Attempt any two parts. | 6\*2=12
(a) | In a multiprogramming and time-sharing environment, several users share the system simultaneously. This situation can result in various security problems. What are two such problems? How are they resolved? | 
(b) | What is the main advantage of the microkernel approach to system design? How do user programs and system services interact in microkernel architecture? What are the disadvantages of using the microkernel approach? | 
(c) | How shared memory is used in process communication? What are its advantages? Explain using the example of POSIX. | 
2  | Attempt any two parts. | 6\*2=12
(a) | Consider the following set of processes: | 
| Process | Arrival time | CPU Burst Time |
P1   | 0            | 25            |
P2   | 5            | 15            |
P3   | 10           | 5             |
P4   | 15           | 3             |
Draw the Gantt chart for Shortest Job First (SJF) and Shortest Remaining Time First (SRTF) scheduling algorithms. Compare average waiting time and average turnaround time for both algorithms. | 
(b) | What are the benefits of multithreading? Explain how threads are cancelled in multithreaded program? What is the use of thread pool? | 
(c) | Why is it necessary for CPU scheduler to distinguish I/O-bound and CPU-bound processes? Consider a system running ten I/O bound tasks and one CPU-bound process. | contd.....2.
task. Assume that the I/O-bound tasks issue an I/O operation once for every-
millisecond of CPU computing and that each I/O operation takes 10 milliseconds to
complete. Also assume that the context-switching overhead is 0.1 milliseconds and
that all processes are long-running tasks. What is the CPU utilization for a round-
robin scheduler when:
a. The time quantum is 1 millisecond
b. The time quantum is 10 milliseconds
Assume suitable data if you think missing.

3

Attempt any two parts.

(a) What is a binary semaphore? How is it used to provide mutual exclusion for n
processes? Show that, if the wait() and signal() semaphore operations are not
executed atomically, then mutual exclusion may be violated.

(b) Provide a solution for first readers-writers problem using semaphores. Does your
solution suffer from starvation problem? Explain. If yes, what you can do to
remove starvation.

(c) What is deadlock prevention method for deadlock problem? Consider the deadlock
situation that could occur in the dining philosophers problem when the
philosophers obtain the chopsticks one at a time. Discuss how the four necessary
conditions for deadlock indeed hold in this setting. Discuss how deadlocks could be
avoided by eliminating any one of the four conditions.

4

Attempt any two parts.

(a) Describe how a 32-bit virtual address could be translated to a physical address
during the execution of a memory reference instruction on a typical modern CPU
that supports paged virtual memory. You should assume that the page size is 4096
bytes and that the system uses two-level paging with page tables at both levels
holding 1024 entries. Explain using a suitable diagram.

(b) Compare the main memory organization schemes of contiguous memory allocation,
segmentation, and paging with respect to the following issues:
a. external fragmentation
b. internal fragmentation
c. ability to share code across processes

t. Explain any two LRU approximation algorithms in brief. Also explain what is
thrashing. Which page replacement algorithm is best suited for preventing
thrashing and why?

3(a) Discuss linked method for allocating disk space to files. Also discuss FAT.

3(b) Differentiate between tree structured and acyclic graph directories. Also explain
how deletion of a file or sub-directory is handled in each type of directory.

3(c) Explain the Linux process scheduling method in brief.
**B.TECH. (AUTUMN SEMESTER) EXAMINATION**
**COMPUTER ENGINEERING**
**COMMUNICATION ENGINEERING**
**ET-340**

Maximum Marks: 60
Credits: 04
Duration: Three Hours

Answer all the questions.
Assume suitable data if missing.
Notations and symbols 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 benefits of performing modulation in communication systems?</td>
<td>03</td>
</tr>
<tr>
<td>1(b)</td>
<td>What are the various properties of a communication channel?</td>
<td>04</td>
</tr>
<tr>
<td>1(c)</td>
<td>Frequency and Phase modulation process are related to each other. Explain how?</td>
<td>04</td>
</tr>
<tr>
<td>1(d)</td>
<td>How an amplitude modulation is achieved in which the modulated signal bandwidth is equal to the bandwidth of the message signal?</td>
<td>04</td>
</tr>
</tbody>
</table>

**OR**

1'(a) Consider a baseband signal $m(t) = \cos (1500\pi t) \cos (3500\pi t)$, do the following: [04]
   1(i) Sketch the spectrum of $m(t)$
   1(ii) Sketch the frequency domain standard amplitude modulated signal if carrier is $c(t) = 2 \cos (50000\pi t)$ and calculate the bandwidth of the modulated signal.

1'(b) Explain the narrow band frequency modulation with clear diagrams. [04]

1'(c) Draw the block diagram of Super Heterodyne Radio Receiver (SHRR). Consider the case of standard AM, obtain the time-domain as well as frequency domain signals after each block by detailed analysis. [07]

2(a) What do you understand by aliasing and inter-symbol interference (ISI)? [03]

2(b) What is FDM? Explain with example. [04]

2(c) Explain pulse code modulation and demodulation process with clear diagrams. If the input to the encoder is 11001001 and encoder is of bipolar RZ type then what will be the output waveform of the encoder? [08]
3(a) What are the advantages and disadvantages of M-ary digital modulation over binary digital modulation?

3(b) Derive an expression for average probability of error in BPSK.

3(c) Explain the generation and detection of QPSK signal with clear diagrams. Sketch the QPSK waveform if the input data stream is 10101111100.

OR

3(e') Derive an expression for probability of error in case of BPSK. Binary data are transmitted over a microwave link at the rate of $10^6$ bits/s, the power spectral density of the noise at receiver input is $10^{-13}$ W/Hz. If the received signal amplitude is 2 mV then find out the average probability of error in case of BPSK, BPSK, and QPSK.

4(a) Given a source $S$, have symbols $\{a_0, a_1, a_2, ..., a_{K-1}\}$ where $K$ is an integer, and their probabilities of occurrence are $\{p_0, p_1, p_2, ..., p_{K-1}\}$ respectively. In accordance with information theory, prove the following:

i) The information in a symbol $a_i$ is 0 if its probability of occurrence is 1.

ii) The entropy of this source is 0 if probability of occurrence of any one of its symbols is 1.

iii) If all symbols are equiprobable then the entropy of the source is $\frac{K-1}{K} \log_2 K$.

4(b) What is source coding theorem? A discrete memoryless source has five symbols whose probabilities of occurrence are as described here:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>$s_0$</th>
<th>$s_1$</th>
<th>$s_2$</th>
<th>$s_3$</th>
<th>$s_4$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability</td>
<td>0.1</td>
<td>0.2</td>
<td>0.15</td>
<td>0.25</td>
<td>0.3</td>
</tr>
</tbody>
</table>

Compute the Huffman codes for this source and find out the coding efficiency.

4(c) Derive an expression for channel capacity. State the channel coding theorem.

OR

4(e') Write a note on spread spectrum modulation.
1 a. Differentiate between luxuries and necessities. 03

b. What is a price demand supply relationship? Explain how the addition of supply for a given demand will establish a new and lower price. 03

c. An engineer has two bids for an elevator to be installed in a new building. The details of the bids for the elevators are as follows:

<table>
<thead>
<tr>
<th></th>
<th>Initial cost (Rs.)</th>
<th>Service life (years)</th>
<th>Annual operations &amp; maintenance cost (Rs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpha Elevator Inc.</td>
<td>4,50,000</td>
<td>15</td>
<td>27,000</td>
</tr>
<tr>
<td>Beta Elevator Inc.</td>
<td>5,40,000</td>
<td>15</td>
<td>28,500</td>
</tr>
</tbody>
</table>

Determine which bid should be accepted, based on the present worth method of comparison assuming 15% interest rate. 06

OR

1' c'. A cement plant plans to open a new rock pit. Two plans have been devised for movement of raw material from quarry to the plant. Plan A requires the purchase of an earth mover and the construction of an unloading pad. Plan B calls for construction of a conveyer system from the quarry to the plant. The expected costs are as follows:

<table>
<thead>
<tr>
<th></th>
<th>PLAN A</th>
<th>PLAN B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mover</td>
<td>45000</td>
<td>175000</td>
</tr>
<tr>
<td>Pad</td>
<td>28000</td>
<td></td>
</tr>
<tr>
<td>Conveyor</td>
<td></td>
<td>2500</td>
</tr>
</tbody>
</table>

Which plan should be selected for an interest rate of 15% per year? 06

2 a. Differentiate between book value and market value. How does depreciation affect a company’s cash flow? 06

Given the data below, find the depreciation and book value in year 3, using a double declining balance method:

First cost: Rs. 400,000
Salvage Value: Rs. 75,000
Life: 5 years

OR

Contd....2.
a' What are the various criteria for performing a cost benefit analysis? Five interdependent proposals are under consideration for a particular project. The present worth of capital requirement and benefits for each proposal are as follows:

<table>
<thead>
<tr>
<th>Alternative</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>PW of Capital (Rs.)</td>
<td>80,000</td>
<td>50,000</td>
<td>72,000</td>
<td>43,000</td>
<td>81,000</td>
</tr>
<tr>
<td>PW of Benefits (Rs)</td>
<td>70,000</td>
<td>55,000</td>
<td>76,000</td>
<td>52,000</td>
<td>84,000</td>
</tr>
</tbody>
</table>

Develop an incremental B/C ratio analysis and select the appropriate alternative.

b Define the terms economic life and useful life of an asset. Two years ago, a machine was purchased at a cost of Rs. 2,00,000 to be useful for eight years. Its salvage value at the end of its life is Rs. 25,000. The annual maintenance cost is Rs. 25,000. The present market value of the existing machine is Rs. 1,20,000. A new machine, with a service life of 6 years, is now available at Rs. 1,50,000. Its annual maintenance cost is Rs. 14,000. The salvage value of the new machine is Rs. 20,000. Using an interest rate of 12%, find whether it is worth replacing the present machine with the new machine.

3  
a Discuss the social responsibilities of an organisation. What are the arguments for and against social responsibility of organisations?

b What are the advantages of group decision making? Differentiate between Delphi and Nominal group decision making techniques.

4  
a What do you understand by organizational planning? Differentiate among tactical and operational plans.

b Describe the five alternatives to job specialization. What is the advantage of each, as compared to specialization?

OR

4'  
a How is leadership different from management? Give suitable example to distinguish between them.

b What are various levels of control system in an organization? Explain the four fundamental steps of any control process.

5  
a Describe the four basic levels of international business activity. Do you think any organization will achieve the fourth level? Why or why not?

b Describe the processes of human resource planning, recruiting and selection.

OR

5'  
a What do you understand by marketing mix or 4P's of marketing?

b Explain the difference between macroeconomics and microeconomics in the context of financial management.