B.TECH. (WINTER SEMESTER) EXAMINATION
COMPUTER ENGINEERING
DISTRIBUTED AND PARALLEL SYSTEMS
CO-405

Maximum Marks: 60
Credits: 04
Duration: Two Hours

Q.No. Question M.M.
1(a) What is Temporal Parallelism? Derive an expression for speedup due to pipeline [04]
    processing.
1(b) Discuss Flynn’s architectural classification of computer systems based on [05]
    multiplicity of instruction and data stream with the help of suitable diagrams.
1(c) Discuss the Direct Mapping technique for cache memory. If the size of one block is [06]
    4 KB and the tag directory size is $10 \times 2^{12}$ bits, find the size of the main memory,
    cache memory and the tag bits for direct mapping.

OR

1(c') Discuss the Set-Associative Mapping for cache memory. If the size of one block is 4 [06]
    KB and the tag directory size is $10 \times 2^{14}$ bits, find the size of the main memory, cache
    memory and the tag bits for a 4-way mapping.

2(a) Discuss the single-stage recirculating network for a Mesh-Connected Illiac Network [07]
    with 16 processors.

OR

2(a') Discuss the single-stage and multistage Shuffle-exchange network. [07]
2(b) Write an algorithm for Odd-Even Transposition sort. Using the algorithm, sort the [08]
    following sequence of characters: (assume A<B)
    
    H F B G D E C A
    
3(a) Discuss the cache coherence problems and explain their remedies. [7.5]

Date: 03/06/18
Time: 12:30
Evening
3(b) Explain Tightly coupled and Loosely coupled systems.

OR

3(b') Assume that the number of processors is three and each task take unit amount of time for completion. Perform Heuristics based Task scheduling on the task graph given in Figure 1.

![Task Graph](image)

Figure 1.

4(a) Design a PRAM algorithm to compute a prefix sum of n numbers with a time complexity of O (log n).

4(b) Design a CRCW Sorting algorithm on PRAM Model.

OR

4(b') Write technical notes on:
   i) Bulk Synchronous Parallel (BSP) model
   ii) Log P Model
Maximum Marks: 60  
Credits: 04  
Duration: Two Hours

**Abbreviations and symbols have their usual meanings.**

<table>
<thead>
<tr>
<th>Q.No.</th>
<th>Question</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1(a)</td>
<td>Explain the basic image formation model.</td>
<td>[03]</td>
</tr>
<tr>
<td>1(b)</td>
<td>What is image sampling and quantization? How these two are related to spatial resolution and intensity resolution respectively?</td>
<td>[06]</td>
</tr>
<tr>
<td></td>
<td>-OR-</td>
<td></td>
</tr>
<tr>
<td>1(b')</td>
<td>Consider the image segment shown in Figure 1. Let V= {0, 1}. Compute the length of the shortest 4-, 8-, and m- path between p and q. If a particular path does not exist between these two points, explain why.</td>
<td>[06]</td>
</tr>
<tr>
<td></td>
<td><img src="image.png" alt="Figure 1: An image segment." /></td>
<td></td>
</tr>
<tr>
<td>1(c)</td>
<td>Discuss 2-D Fourier transform. What is Fourier spectrum and phase angle? Which one is dominating in determining the feature content of an image?</td>
<td>[06]</td>
</tr>
<tr>
<td>2(a)</td>
<td>What is the cause of ringing artifact in ideal low pass filtering? How is it prevented by Gaussian low pass filter?</td>
<td>[04]</td>
</tr>
<tr>
<td>2(b)</td>
<td>What are the different types of data redundancies found in digital images? Explain.</td>
<td>[06]</td>
</tr>
<tr>
<td>2(c)</td>
<td>Consider the sample 4x8, 8-bit image:</td>
<td>[05]</td>
</tr>
<tr>
<td></td>
<td><img src="image.png" alt="Sample image" /></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Compress the image using Huffman coding.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-OR-</td>
<td></td>
</tr>
<tr>
<td>2(c')</td>
<td>Show that the frequency domain equivalent of Laplacian operator is (-4\pi^2) ((u^2 + v^2)).</td>
<td>[05]</td>
</tr>
</tbody>
</table>

\[
\nabla^2 f(x,y) \overset{\text{FT}}{\Rightarrow} -4\pi^2(u^2 + v^2)F(u,v)
\]
3(a) Discuss the detection of edges using Canny Edge Detector.
3(b) Explain region based segmentation using region splitting and merging.
3(c) How connected components can be extracted using morphological image processing?

-OR-

3(c') Explain the following morphological operators.
   i. Erosion
   ii. Dilation

4(a) Write a short note on any three topics.
   i. Printed Character Recognition.
   ii. Evaluation metrics for Biometric Authentication Systems.
   iii. Applications of CBIR technology.
   iv. General issues in Digital Watermarking.
   v. Image Registration.
2(a) For converting the partial list into a full list, differentiate between the reverse ranking and the average ranking methods. Use suitable examples to mark the difference clearly.
2(b) Out of the Borda’s method and the MFO method of Rank Aggregation, which is better and why?

3(a) Why do we prefer to use the relative linguistic quantifier “at least half” for the Improved Shimura Technique of Rank Aggregation. Explain.

3(b) Using Mean By Variance technique of Rank Aggregation, find out the aggregated list of [4,2,1,5,3,6], [5,2,1,3,6,4], [3,1,2,4,6,5] and [2,6,1,3,5,4].

4(a) Using the notion of “Computing with Words”, evaluate the following: “at least half”(0.4, 0.1, 0.8, 0.6, 0.0, 0.3, 0.5, 0.7).

4(b) Find out the Fuzzy Preference Relation R, from the user preference ordering given by the sequence vector V = (6, 1, 4, 2, 5, 3).

OR

4’(a) Why is the problem of Rank Aggregation considered to be NP-hard? Explain.

4’(b) What are Protoforms? With the help of suitable examples, describe the structure and meaning of the 5 basic Protoforms in Precisiated Natural Language (PNL).
Maximum Marks: 60
Duration: Two Hours

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

<table>
<thead>
<tr>
<th>Q1(a)</th>
<th>What are the factors on which power consumption in a VLSI circuits depends? What is the effect of increasing bias voltage of the system, on power consumption and delay?</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>(b)</td>
<td>What are the different Transistor parasitics?</td>
<td>4</td>
</tr>
<tr>
<td>(c)</td>
<td>Sketch the layout of an inverter and hierarchical Stick Diagram of a full adder suitable for standard cell based design style (use proper color code).</td>
<td>6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Q2(a)</th>
<th>What is Left Edge Algorithm? Where is it used in VLSI Physical Design and under what condition it cannot be used?</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>(b)</td>
<td>On what factors the delay of combinational logic networks depend. Discuss the solutions to reduce the delay</td>
<td>7</td>
</tr>
</tbody>
</table>

- **OR**

<table>
<thead>
<tr>
<th>Q2(b′)</th>
<th>Why are two-phase clocks used in Latch based systems? Design a “101” sequence detector using suitable codes for states, that decrease hardware for combinational logic.</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>(c)</td>
<td>What are the different types of Stuck-At faults? Why is it hard to detect faults in sequential circuit?</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Q3(a)</th>
<th>What is critical path? Which path in an adder is considered as critical path of adder?</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>(b)</td>
<td>What is Barrel shifter? Design a Barrel shifter that can shift 4-bit in a single instruction (single clock cycle).</td>
<td>7</td>
</tr>
</tbody>
</table>

- **OR**

<table>
<thead>
<tr>
<th>Q3(b′)</th>
<th>Explain how the speed of carry generation can be enhanced by using Manchester Carry Chain. Sketch the circuit of 2-bit Manchester Carry Chain and explain its operation.</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>(c)</td>
<td>Generate three bit Booth Codes for the following 8-bit decimal number: 28, -33, 17, -50. Multiply 13 by -17 by using Booth Algorithm</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Q4(a)</th>
<th>What is Compaction? What are different applications of compaction?</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>(b)</td>
<td>Under what condition, the longest path algorithm does not give optimal result in polynomial time? Give example.</td>
<td>4</td>
</tr>
</tbody>
</table>

**contd... 2.**
Determine the optimal compaction for the cells shown in figure 1 such that the design rules are not violated. Given that:

Minimum width and separation are:
A = 2; A to B = 3
B = 4; D to C = 6
C = 8;
D = 3; D to E = 3
Block E cannot move toward left for more than one unit i.e. X₁₁ - X₁₀ ≤ 1

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4'(a) What are constructive and iterative placement algorithms?

(b) Use Kernighan and Lin algorithm to partition the graph shown in figure 2.

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2017-18
B.TECH. (WINTER SEMESTER) EXAMINATION
COMPUTER ENGINEERING
MULTIMEDIA TECHNOLOGIES
CO-450

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>
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<tbody>
<tr>
<td>1(a)</td>
<td>Why is compression important in multimedia?</td>
<td>[03]</td>
</tr>
</tbody>
</table>
| 1(b)  | A series of message is transmitted between two computers over a PSTN. The message comprises just the characters A through H. The probability(frequency of occurrence) of each character is as follows: A and H = 0.25, C and D = 0.14, E, F, G and H = 0.055  
  i. Derive the minimum average number of bits per character using Shannon’s formula.  
  ii. Use the Huffman coding to derive set of code word. | [06] |
| 1(c)  | Encode the following stream of characters using arithmetic coding compression: MEDIA  
  You may assume that characters occur with probabilities of M = 0.1, E = 0.3, D = 0.3, I = 0.2 and A = 0.1 | [06] |
|       | OR  
| 1(c') | Show how you would use Adaptive Huffman coding to encode the following set of tokens: TENNESSEE  
  How is this message transmitted when encoded? | [06] |
2(a) Why do printers use CMYK color model? [03]

2(b) What do you mean by spatial frequency in an image? How to calculate the value of spatial frequency in JPEG? [06]

2(c) Define the terms "sharpness" and "contrast". Briefly describe about the quantization process of JPEG. [2+4]

OR

2(e') Write the differences between analog video and digital video. [3+3]

Following is the table of Default Huffman codewords for DC Coefficients:

<table>
<thead>
<tr>
<th>SSS</th>
<th>Huffman Codeword</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>010</td>
</tr>
<tr>
<td>1</td>
<td>011</td>
</tr>
<tr>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>00</td>
</tr>
<tr>
<td>4</td>
<td>101</td>
</tr>
<tr>
<td>5</td>
<td>110</td>
</tr>
<tr>
<td>....</td>
<td>....</td>
</tr>
</tbody>
</table>

Determine the encoded version of the following DC coefficients from the consecutive DCT blocks: 11, 13, 12, 12, 10.

3(a) Explain working principal of Voice recognition system. [03]

3(b) Given the following string as input, /TAN/HAN/HAN/AN/, with the initial dictionary below, encode the sequence with the LZW algorithm, showing the intermediate steps.

<table>
<thead>
<tr>
<th>Index Entry</th>
<th>Index Entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>/</td>
</tr>
<tr>
<td>2</td>
<td>H</td>
</tr>
<tr>
<td>3</td>
<td>A</td>
</tr>
<tr>
<td>4</td>
<td>N</td>
</tr>
<tr>
<td>5</td>
<td>T</td>
</tr>
</tbody>
</table>
3(c) Briefly describe the MPEG Perceptual Audio Coding with suitable diagrams.
   OR
3(e') Briefly explain Linear Predictive Coding technique.

4(a) What is MJPEG? What are the limitations of it?
4(b) Write a short note on MPEG-2. What are the advantages of it over MPEG-1?
4(c) Explain different type of frames of a video and their encoding techniques. Why are B-frames used?
   OR
4(e') Assume the frame sequence of a video is IBPBPBI.... Average compression ratio of I-frame is 10:1, P-frame is 30:1 and B-frame is 50:1. Find the average bit rate of that video after MPEG-1 compression. (Frame rate: 30 fps and resolution: 352×288).

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2017-18
B.TECH. WINTER (VIII SEMESTER) EXAMINATION
COMPUTER ENGINEERING
MOBILE COMPUTING
CO-452

Maximum Marks: 60  Credits: 04  Duration: Two Hours

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

Q.No.  Question  M.M.
1(a) Give a comparison of mobile communication systems (mobile station and base station) for TV remote control, garage door opener, paging system, cordless phone and cellular phone. Parameters to be compared are coverage range, required infrastructure, complexity, hardware cost, carrier frequency and functionality. [08]

1(b) Differentiate among IS-54, IS-136, GSM, IS-95, GSM-1800, CDPD, GPRS, EDGE, IS-95B, cdma2000, UMTS, HSDPA, HSUPA, HSPA+, Wi-MAX, LTE and LTE-Advanced. List the characteristic features of these technologies and mobile generation they belong to. [07]

OR

1(b') List the various major mobile radio standards for Europe and Japan describing the type of technology, year of introduction, multiple access, frequency band, modulation and channel bandwidth. [07]

2(a) Explain the D-AMPS model of cellular telephony. What is the operating frequency, channel width, frequency reuse factor and number of channels for D-AMPS? Draw suitable diagrams. [08]

2(b) How does Roaming function in a Mobile Cellular Network? What is Roaming Management? What do the terms HLR and VLR stand for? [07]

OR

Contd...  2.
2(b') Discuss in detail the upgrade path of the various 2G technologies? Draw a suitable flow chart for the same and explain in detail. [07]

3(a) Explain the Tromboning trunk setup in signalling relay function in Mobile Number Portability (MNP)? Draw suitable diagrams to support your answer. [08]

3(b) How would you roll out data services over D-AMPS cellular networks? Explain the network architecture. Where do the various components viz. MD-IS, MDBS, M-ES, AMPS BS, MS and AMPS MSC integrate into the network. [07]

OR

3(b') What is cellular internet access? What do you understand by SGSN and GGSN? What 2G mobile technology they assist. Explain in detail with the help of suitable diagrams. [07]

4(a) For the mobile internet access methods viz HSPA+, LTE, WiMAX, Flash-OFDM, HIPERMAN, Wi-Fi, iBurst, EDGE Evolution, UMTS W-CDMA, HSDPA+HSUPA, UMTS-TDD, EV-DO Rel. 0, EV-DO Rev. A and EV-DO Rev. B. In a tabular format list the following characteristics family, primary use, radio technology, downstream and upstream bandwidth. [08]

4(b) Explain the Nortel W-CDMA 3G field trial system. Draw suitable network diagrams. [07]

OR

4(b') Explain the Motorola cdma 3G field trial system. Draw suitable network diagrams. [07]