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

Q.No. | Question | M.M.
--- | --- | ---
1(a) | Describe the language design trade-offs on the basis of language evaluation criteria. | 05
1(b) | Discuss any three programming language with their advantages and disadvantages. | 05
1(c) | Differentiate constant and variable in context of programming language. | 05

OR

1(c') | Write all ancestors of the following programming languages: (i) Ada95, (ii) PHP, (iii) Visual Basic.NET, (iv) C#, and (v) Haskell | 05

2(a) | Explain the pointer concepts in C programming language. | 05
2(b) | Describe ‘enumeration’ in any programming language with examples. | 05
2(c) | What are the order of evaluation of operators and operands in a programming language? Explain with suitable example. | 05

OR

2(c') | Define guarded command. Explain Dijkstra’s selection construct and Dijkstra’s loop structure with the help of flow graphs. | 05

3(a) | Describe Data Abstraction. How the languages C# and Ruby provide data abstraction? Explain. | 05
3(b) | Write a short note on process and process scheduling. What do you mean by multithreading. | 05
3(c) | Describe the characteristics of an object oriented programming languages, list these in terms of smalltalk. | 05

OR

3'(a) | What are the possible levels of concurrency in a program? Point out the differences between physical and logical concurrency. | 05
3'(b) | Describe different parameter passing techniques. Briefly explain “call by name”. | 05
3'(c) | Explain exception handling in java with example. | 05

4(a) | Write a Scheme function that takes a simple list of numbers as its parameter and return the mean and median of the list. | 05
4(b) | What are the advantages and disadvantages of PROLOG programming language? | 05
4(c) | Explain the deficiencies in LISP. Compare it with PROLOG. | 05
2014-15
B.TECH. (WINTER SEMESTER) EXAMINATION
COMPUTER ENGINEERING
DISTRIBUTED AND PARALLEL SYSTEMS
CO-405

Maximum Marks: 60 Credits: 04 Duration: Three Hours

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

Q.No. Question M.M.
1(a) Perform the computation \((A_i \times B_i + C_i)\) on a stream of numbers using pipeline [06]
processing. Draw the pipeline structure and show the content of registers in the
pipeline at each clock.
1(b) State Amdahl’s and Gustafson’s –Barris laws. Make a comparison between the two
using a graph.

OR

1’(a) With the help of suitable diagrams, explain Flynn’s Classification based on the
multiplicity of instruction and data stream. [06]
1’(b) Consider a Mesh-Connected Illiac Network with \(N=64\) PE’s. If PE\(_i\) is the source
node, show that any PE is reachable from PE\(_i\) in \(\sqrt{N} - 1\) steps.

2(a) Devise a CRCW PRAM algorithm to sort ‘n’ numbers stored in an array with a
constant time complexity. [06]
2(b) How does CUDA accelerate computing using GPUs? Explain with the help of the
following sequential code.
   for \(i = 1\) to \(n\) do
   \(A[i] = B[i] + C[i]\)
   endfor

OR

2’(a) Draw the high level architecture of SIMD array processors explaining the role of
2'(b) A shuffle-exchange network can simulate a hypercube network. Because not every pair of nodes connected in a hypercube is connected in a shuffle-exchange network, a single hop along a communication link in a hypercube may turn into several hops in a shuffle-exchange network. Derive an upper bound on the maximum number of communications necessary in a shuffle-exchange network to simulate a single communication in a hypercube.

3 Devise an algorithm $M(x,y)$ where ‘$x$’ is the number of rows and ‘$y$’ is the number of columns with mesh-interconnection of PE’s to sort elements using Batcher’s odd-even merge sort. Considering $t_R$ be the routing time required to move one item from a PE to one of its neighbours and $t_C$ be the comparison time for one comparison. Find out the complexity of the algorithm $M(n,n)$. Show the various steps of algorithm $M(x,y)$ on the following mesh.

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>13</td>
<td>14</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4 Devise a PRAM algorithm to perform a Preorder traversal of a tree with $n$ elements, with a time complexity of $\Theta(\log n)$. Discuss the various data structures being used and explain how the complexity of $\Theta(\log n)$ is achieved.

5(a) Devise a PRAM algorithm to add ‘$n$’ numbers with a complexity of $\Theta(\log n)$.
5(b) State and prove the Brent’s theorem.
5(c) Use the Brent’s theorem to modify the algorithm in part (a) to a cost-optimal PRAM algorithm.
2014-15  
B.TECH. WINTER (VIII) SEMESTER EXAMINATION  
COMPUTER ENGINEERING  
SOFT COMPUTING (CO - 444)

Maximum Marks: 60  
Credits: 04  
Duration: Three Hours

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

<table>
<thead>
<tr>
<th>Q.No.</th>
<th>Questions</th>
<th>M.M.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1(a)</td>
<td>Define a fuzzy set $A$ on Universe of Discourse (UoD), $X$ when the UoD is</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(i)  Discrete and finite</td>
<td>[7.5]</td>
</tr>
<tr>
<td></td>
<td>(ii) Continuous and infinite</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Suppose we have a universe of discourse temperature between 130 to 140</td>
<td></td>
</tr>
<tr>
<td></td>
<td>degrees Fahrenheit (F). We define the following linguistic terms.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$\text{&quot;low&quot;} = \begin{bmatrix} 1 \div 131 + 0.8 \div 132 + 0.6 \div 133 + 0.4 \div 134 + 0.2 \div 135 + 0 \div 136 \end{bmatrix}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$\text{&quot;high&quot;} = \begin{bmatrix} 0 \div 134 + 0.2 \div 135 + 0.4 \div 136 + 0.6 \div 137 + 0.8 \div 138 + 1 \div 139 \end{bmatrix}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Find the following membership function</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(i) Temperature &quot;not very low&quot;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(ii) Temperature &quot;not very high&quot;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(iii) Temperature &quot;not very low and not very high&quot;</td>
<td></td>
</tr>
</tbody>
</table>

1(b)  What is a fuzzy relation, $R$? Write down the properties of fuzzy relation.  

Let fuzzy sets $A = \begin{bmatrix} 0.1 \div x_1 + 0.9 \div x_2 + 0.0 \div x_3 \end{bmatrix}$ and $B = \begin{bmatrix} 0 \div y_1 + 1 \div y_2 + 0 \div y_3 \end{bmatrix}$ be defined on Universe of Discourse (UoD) $X = \{x_1, x_2, x_3\}$ and $Y = \{y_1, y_2, y_3\}$ respectively.

(i) Find the relation $R$: "If $x$ is $A$ then $y$ is $B$" i.e. $R = (A \times B) \cup (\overline{A} \times Y)$.

(ii) Given $A' = \begin{bmatrix} 0.3 \div x_1 + 1.0 \div x_2 + 0 \div x_3 \end{bmatrix}$, using fuzzy relation $R$ computed in section (i)

above, infer (compute) $B'$ based on

(a) Max-min (b) Max-product compositions.
2(a) Describe the model of an artificial neuron with a threshold logic unit as activation function. Can it handle linearly separable problem?

2(b) What do you mean by back propagation in multilayer neural network? For a back propagation training of neural network, derive the weight update rules for
(a) Final Layer and
(b) Intermediate or hidden layer

OR

For the data given in the following table, show the first iteration in trying to compute the membership value for the input variable X₁ and X₂ in the output region R¹ and R². Use a 2 x 3 x 3 x 2 neural network. Use unipolar sigmoid function

<table>
<thead>
<tr>
<th>X₁</th>
<th>X₂</th>
<th>R¹</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.05</td>
<td>0.02</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Initial weights connecting elements in the layers in the network (2 x 3 x 3 x 2) are

<table>
<thead>
<tr>
<th>W₁₁</th>
<th>W₁₂</th>
<th>W₁₃</th>
<th>W₂₁</th>
<th>W₂₂</th>
<th>W₂₃</th>
<th>W₃₁</th>
<th>W₃₂</th>
<th>W₃₃</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>0.4</td>
<td>0.1</td>
<td>0.2</td>
<td>0.6</td>
<td>0.2</td>
<td>0.5</td>
<td>0.3</td>
<td>0.6</td>
</tr>
<tr>
<td>0.1</td>
<td>0.55</td>
<td>0.35</td>
<td>0.2</td>
<td>0.45</td>
<td>0.35</td>
<td>0.25</td>
<td>0.3</td>
<td>0.6</td>
</tr>
<tr>
<td>0.3</td>
<td>0.3</td>
<td>0.2</td>
<td>0.15</td>
<td>0.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3(a) Discuss the principles of operation in Fuzzy Control of Washing Machine. Also write few rules.

3(b) Give block diagram structure of a Fuzzy Logic Controller.
The following table defines fuzzy subsets NS, ZE, and PS on discrete computational Universe of Discourse (UoD) [-4, 4] where e is error, ce is change in error, and du is change in control action.

<table>
<thead>
<tr>
<th>E, CE, DU</th>
<th>-4</th>
<th>-3</th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>NS</td>
<td>0.3</td>
<td>0.7</td>
<td>1</td>
<td>0.7</td>
<td>0.3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ZE</td>
<td>0</td>
<td>0</td>
<td>0.3</td>
<td>0.7</td>
<td>1</td>
<td>0.7</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>PS</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.3</td>
<td>0.7</td>
<td>1</td>
<td>0.7</td>
<td>0.3</td>
</tr>
</tbody>
</table>

Using the following two fuzzy control rules R₁ and R₂ (only), infer defuzzified output duk (on computational UoD), if at any particular sampling instant k the error (ek) and change in error (cek) are measured as ek = -2, and cek = 1

R₁: If e is NS and ce is ZE then du is PS
R₂: If e is ZE and ce is PS then du is ZE

Contd... 3
4(a) The following table gives fitness value for 8 individuals (population number)

<table>
<thead>
<tr>
<th>Individuals</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fitness value</td>
<td>1.0</td>
<td>2.10</td>
<td>3.11</td>
<td>4.01</td>
<td>4.66</td>
<td>1.91</td>
<td>4.55</td>
<td>1.93</td>
</tr>
<tr>
<td>Random No.</td>
<td>0.25</td>
<td>0.04</td>
<td>0.10</td>
<td>0.49</td>
<td>0.62</td>
<td>0.3</td>
<td>0.24</td>
<td>0.70</td>
</tr>
</tbody>
</table>

For the roulette-wheel selection scheme of Genetic Algorithm (GA), compute the probability ($p_i$) of the $i$th individual getting selected and cumulative probability ($P_i$). Then find out the final count of each individual in the population pool after first generation based on the random numbers (0-1) given in the table corresponding to each individual. Present your result in a tabular form.

4(b) What are the disadvantages of roulette-wheel selection in GA? How can the disadvantages of roulette-wheel selection be overcome in rank selection method? Discuss tournament selection method and elitism in Genetic Algorithm.

OR

4'(a) Differentiate between tolerance relation and equivalence relation by giving example.

4'(b) Explain Fuzzy c-mean clustering algorithm for classification.
Q.No. | Question                                                                                                                                                                                                 | M.M. |
-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
1(a) | Draw the Header of IPv4 Internet Protocol and explain the various fields in it.                                                                                                                             | [09] |
1(b) | Differentiate between Packet switched and Circuit switched networks.                                                                                                                                          | [06] |
     | **OR**                                                                                                                                                                                                    |      |
1(b')| Discuss the two Sliding window protocols go-back-n and selective repeat with the help of an example.                                                                                                       | [06] |
2(a) | For a single bit Error-Correcting code find the Code-words for the word CODE given by the ASCII value, using even parity.                                                                            | [09] |
     | C 1100011                                                                                                                                                                                               |      |
     | O 1101111                                                                                                                                                                                               |      |
     | D 1100100                                                                                                                                                                                               |      |
     | E 1100101                                                                                                                                                                                               |      |
2(b) | Derive and compare the expression of the throughput for Slotted and Pure ALOHA.                                                                                                                             | [06] |
     | **OR**                                                                                                                                                                                                   |      |
2(b')| Highlight the difference between Distance vector routing and link state routing.                                                                                                                             | [06] |

contd... 2
3(a) Explain data abstraction methodology in DBMS. Also describe the roles of different database users.

3(b) Why is data dictionary used in DBMS? What is the difference between primary key and candidate key?

OR

3(b') What is the need of different levels of normalisation? What do you mean by functional dependency?

4(a) Consider a banking database that consists of the following relations:

CUSTOMER (Name, A/C_no, Address, Contact, DOB);
ACCOUNT (A/C_no, Br_code, Balance);
BRANCH (Br_code, Br_name, City);

Now write the SQL statements for following operations:

(i) Calculate the number of customers born on 31st December. (Suppose the format of DOB is dd/mm/yyyy).

(ii) Find the maximum balance of different city.

(iii) Increment the balance of all accounts of Delhi city by 6% and the accounts of other cities by 5%.

(iv) What is the use of VIEW operation? Provide its syntax in SQL for a view A/C_Details having attributes A/C_no, Br_Name, Name and Balance.

4(b) Briefly describe about the different types of failures in DBMS. What is RAID technology?

OR

4(b') What are the ACID properties in transaction management?
2014-15  
B.TECH. (WINTER SEMESTER) EXAMINATION  
COMPUTER ENGINEERING  
EMBEDDED SYSTEMS  
CO-448

Maximum Marks: 60  
Credits: 04  
Duration: Three Hours

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

Q.No.  Question

1(a) Describe Embedded System and its components with the help of a block diagram. [05]  

What are the challenges of Embedded System? [05]  

1(b) Draw a sequence diagram for a train control commands. [05]  

1(c) Draw a state diagram for visualization of washing machine control program. [05]  

OR

1(c') Draw a class diagram for the classes required in a basic microwave oven. The system should be able to set the microwave power level between 1 and 9 and time a cooking run up to 59 min and 59 s in 1-s increments. Include * classes for the physical interfaces to the telephone line, microphone, speaker, and buttons. [05]  

2(a) What is Watchdog Timer? What is the significance of watchdog timer in Embedded Systems? [05]  

2(b) Explain the working of 16F84A Timer 0 module with the help of block diagram. [05]  

2(c) Draw Architectural Block Diagram for PIC 12 series family. Also mention the bus description for 12F508. [05]  

OR

2'(a) What is the size of instruction set of PIC 16F877. Classify this instruction and give a brief description of any 10 instructions. [05]  

2'(b) Discuss Design Flow in Embedded Systems Development. What are the umbrella activities in this process? [05]  

contd...
2'c) Briefly explain different design steps for a GPS moving map systems.

3(a) Answer the following questions about the ARM programming model:
   a. How many general-purpose registers are there?
   b. What is the purpose of the CPSR?
   c. What is the purpose of the Z bit?
   d. Where is the program counter kept?
   e. How do you return from an ARM procedure?

3(b) How would the ARM status word be set after these operations?
   a. 2 - 3
   b. \(-2^{32} + 1 - 1\)
   c. \(-4 + 5\)

OR

3(b') What is the difference between a big-endian and little-endian data representation?

3(c) Differentiate ARM and SHARC bus system and Describe different Addressing modes in ARM7.

4(a) What problem might occur in a shared memory process communication? How can you overcome that problem?

4(b) Explain the required characteristics of a scheduling algorithm in embedded system. Describe Priority-driven scheduling in embedded system.

OR

4(b') Explain working of UART and USART Bus in embedded system. What is the use of prescaler in transmission.
2014-15
B.TECH. WINTER (VIII SEMESTER) EXAMINATION
COMPUTER ENGINEERING
COMPUTER NETWORK DESIGN
CO-451

Maximum Marks: 60
Credits: 04
Duration: Three Hours

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

Q.No. | Question                                                                 | M.M. |
-----|---------------------------------------------------------------------------|------|
1(a) | What do you understand by Internetworking concepts? Consider a legacy telephone network, cable network and cellphone network. Explain internetworking concepts in view of the above scenario. Draw suitable network diagrams. | 08   |
1(b) | Consider the network diagram given below. Explain in detail the hierarchical network design approach to network implementation. | 07   |

OR

1(b') With the help of suitable examples and diagrams explain the concept of IP addressing, and summarization. What is the difference between a transit AS and a peer-to-peer AS? 07
2(a) What are the different CO and CPE equipment used in a DSL network? What different interfaces are present in a DSLAM? Where do we connect an ADSL modem? What are the different flavours of DSL? Consider the network diagram given below.

2(b) Consider the HFC network given below. How will you roll out data services on this network? What are the downstream and upstream frequencies and channel width for DOCSIS and Euro-DOCSIS?
2(b') Where are routers and switches used in a network? Differentiate between a router and switch. What type of Ethernet interfaces and serial interfaces are present on the router and a switch. Consider the figure given below.

3(a) Implement BGP routing for the network given below.

3(a') Implement PAT on router A for the network given below. Assume there are 3 more servers running http, smtp, and ftp protocols behind router A.
3(b) For the Cisco ASA firewall network given below, explain the network. LAN1 and LAN2 are in the MZ. All network traffic to the inside of the network is blocked. Only traffic to the outside from the MZ is allowed.

OR

3(b') Why do we implement uplink fast in a switching network? For a network with 3 switches in the distribution layer and 6 switches in the access layer explain the uplink fast implementation.

4(a) Propose a server farm design for an ISP with the following servers;

HTTP, SMTP, FTP, DNS, DHCP and RADIUS

4(b) Suppose you have to design a university LAN. This university also has two remote campuses. What technology you will implement for this network. Explain with the help of a suitable network diagram.

OR

4(b') Write down the IOS command lines for the following configurations:

i. OSPF configuration
ii. BGP configuration
iii. NAT configuration