# B.TECH. (WINTER SEMESTER) EXAMINATION
## COMPUTER ENGINEERING
### COMPILER DESIGN
#### CO406

**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>Question</th>
<th>M.M.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1(a)</td>
<td>Give the followings –</td>
<td>[7.5]</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Unambiguous grammar for boolean expression</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Regular definition for keywords of C language</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Syntax tree for the expression $p=(a&gt;b) ? a[x] + y : a[x] * y$</td>
<td></td>
</tr>
<tr>
<td>1(b)</td>
<td>Describe the scheme to reduce the space needed for storing transition table in lexical analyzer.</td>
<td>[7.5]</td>
</tr>
<tr>
<td>2(a)</td>
<td>Give unambiguous grammar for arithmetic expression and construct SLR parsing table for your grammar. Assume that arithmetic expression is containing operators $+,-,\times,/ \text{ and no parentheses.}$</td>
<td>[7.5]</td>
</tr>
<tr>
<td>2(b)</td>
<td>Give definition of followings –</td>
<td>[7.5]</td>
</tr>
<tr>
<td></td>
<td>• Synthesized and Inherited Attribute</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• S-Attributed Definition</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• L-Attributed Definition</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>OR</strong></td>
<td></td>
</tr>
<tr>
<td>2'(a)</td>
<td>Give syntax directed definition that takes series of numbers separated by comma as input and verifies whether the given series is Fibonacci series.</td>
<td>[7.5]</td>
</tr>
</tbody>
</table>

*contd...*
2'(b) Construct predictive parsing table for the following grammar:

\[
S \rightarrow BS \mid \alpha \alpha A \mid d \\
A \rightarrow a \mid c \\
B \rightarrow b
\]

3(a) Give three address code of the following:

\[
\text{while } (a > b) \text{ do while } (c > d) \text{ do } p = p + a; \\
\text{if}(p > a) \text{ then } p = p + b \text{ else } p = p - b; \\
m = p^*(a - b);
\]

Use any translation scheme to obtain the three address code. No need to show steps of parsing.

3(b) Describe the content of Activation Record Block.

OR

3'(a) Consider a new looping statement \textit{whilefalse} whose syntax is - \textit{whilefalse} (B) do S. This loop executes as long as boolean expression is false and terminates on boolean expression becoming true. Give a backpatching based translation scheme to translate this loop to three address code.

3'(b) Give any translation scheme to translate if-then-else to three address code.

4(a) Write steps of the GETREG function.

4(b) Write a short note on Live Variable Analysis.
Q.No. | Question | Marks
--- | --- | ---
1(a) | Write short note on:  
   i. Server farms  
   ii. Compression in DNS response  
   iii. W3C Recommendations | [06]
1(b) | Each swarm of traditional BitTorrent has a centralized tracker. Discuss the scheme devised to decentralize the working of tracker. | [05]
1(c) | What is Network Address Translation? What are its uses? | [04]
2(a) | What do you mean by Source Quench? Give the format of ICMP Source Quench Message. | [06]
2(b) | Discuss about the various SNMP message types that are exchanged between SNMP manager and SNMP agent. | [05]
2(c) | What are cookies? How can cookies be beneficial? Explain with an example. | [04]
3(a) | Explain the various system calls that can be used to receive data from the socket. | [05]
3(b) | Explain about connection termination in TCP. What is the significance of TIME-WAIT state? | [05]

OR

3'(a) | Why must value-result arguments such as length of a socket address be passed by reference? | [03]
3'(b) | Explain Congestion Control in TCP. | [07]
3(c) Explain any two of the following functions:
   i. Fork and exec functions
   ii. Byte ordering function
   iii. listen function

4(a) Explain the role of each phase in SSL Handshake Protocol. [06]

4(b) Define Kerberos and name its servers. Briefly explain the functions of each server. [05]

4(c) Explain the concept of Blind Signature based on RSA Scheme. [04]

OR

4'(a) Compare Data-origin Authentication and Entity Authentication. Define a Dictionary attack and how can it be prevented in case of Fixed password approach for entity authentication. [06]

4'(b) What is Cryptanalysis? Explain Playfair Cipher and Vigenere Cipher with their Cryptanalysis. [05]

4'(c) List the functions of PKI (Public Key Infrastructure). [04]
Answer all the questions.
Assume suitable data if missing.
Notations used have their usual meaning.

Q.No.                        Question                                                                                   M.M.

1(a) For any **TWO** of the following, differentiate between                                  [2.5*2]
   i. General Purpose Systems and Embedded Systems
   ii. Microprocessors and Microcontrollers
   iii. Von-Neumann and Harvard Architecture
   iv. RISC and CISC Architecture

1(b) Draw and describe the SRAM based programmed LUT for the following function;         [05]
     \[ Y = (a \land b) \lor \lnot c \]

1(c) Discuss Design Flow in embedded system. Draw a Sequence Diagram for a              [05]
     sequence of train control commands.

1(c') Discuss the working of a multistage watchdog timer with the help of suitable block    [05]
     diagram.

2(a) Draw Architectural Block Diagram for PIC 12 series family. Also mention the BUS     [05]
     description for 12F508 in it.

2(b) Discuss PIC's 16F84A Status Registers structure and bits significance in detail.     [05]

2(c) Mention all different types of operand possible in a 16-series PIC instruction; also  [05]
     mention the number of bits used for different types of operand.

   **OR**

2(c') Classify the instructions of PIC 16 series family and give a brief description of any  [05]
     05 instructions.

*Contd.....2.*
3(a) Describe Direct-mapped cache implementation, thereby explaining the process of cache hit.

3(b) Draw and describe the 32-bit ARM instruction format.

3(c) Write ARM assembly code to implement the following if-else conditional statement used in C programming:

\[
\text{if}(a > b) \{
    x=1; \ y=2;
\}
\]
\[
\text{else} \{
    x=3; \ y=4;
\}
\]

OR

3(c') Draw basic ARM and SHARC programming models.

4(a) Describe ARM procedure Call Standards (APCS) for procedure linkage mechanism. Give an example of each of the following:

i. Procedure Inlining
ii. Loop Unrolling
iii. Loop Fusion
iv. Loop Tiling

4(b) For the following sample C code, draw the life-time graph and allocate the registers for the variables:

\[
w = a + b;
\]
\[
x = c + d;
\]
\[
y = x + e;
\]
\[
z = a - b;
\]

Can you suggest any other sequence of execution of these statements to reduce the requirements of the registers?

4(c) What problem might occur in a shared memory process communication? How can you overcome that problem? Give an example of an ARM atomic instruction.

OR

4(c') Explain CAN Bus system for Embedded System, give CAN data frame format.
Q.No. | Question | M.M.
--- | --- | ---
I(a) | In light of internetworking concepts explain how is data delivered on Radio Access Networks (RAN)? Consider the cellphone network given below. | [08]

I(b) | For the network diagram depicted below, implement suitable IP addressing scheme of your choice. What will be the summarized IP schema for the different Autonomous Systems (AS)? | [07]
1(b') Discuss in detail the hierarchical network design approach. In the network given below, what type of devices will be connected at the access, distribution and core layers respectively.

Contd.....3.
2(a) What are the different CO and CPE equipment used in a DOCSIS network? What different interfaces are present in a CMTS? Where do we connect a cable modem? What are the downstream and upstream frequencies and channel width for DOCSIS and Euro-DOCSIS? In the HFC network given below how it is integrated with the PSTN, Cellphone and IPTV networks.

[Diagram of HFC network]

2(b) In the diagram given below, differentiate between the different connectors. On what media do we deploy these connectors? Explain the following standards 10GBaseSR, 10GBaseLX4, 10GBaseLR, 10GBaseER, 10GBase-SW, 10GBase-LW, 10GBase-EW, 10GBaseT, 40GEthernet and 100GEthernet.

[Diagram of connectors]

Contd....4.
OR

2(b') Depicted below is the backplane design of a Cisco 6260 DSLAM (DSL Access Multiplexer). What different types of interfaces are present in this DSLAM?

3(a) Explain the Cisco ASA firewall network design for the network given below. What do the terms MZ and DMZ mean? What will be possible policies for implementation in the MZ and DMZ of the given network?
3(b) Implement NAT for the network given below:

OR

3(b') Explain the BGP network design for the network given below. Choose suitable IP addressing of your choice.
4(a) Explain the IDC server farm design depicted below. What is uplink fast and backbone fast in a switching network? Where are the various servers placed in an IDC? Where can we place the following servers: HTTP, SMTP, FTP, DNS, DHCP and RADIUS

4(b) How is an ISP different from an IDC? Discuss in detail the ISP network given below;
4(b') How are Data Wireless Networks different from Mobile Wireless Networks? What is the difference between Wi-Fi and Wi-Max networks? Consider the network diagram given below for reference.
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)  Write down the algorithms for breadth first search and depth first search and list the different advantages of each over other.  [8]
1(b)  List and discuss the two major ways in which domain specific heuristic knowledge can be incorporated into a rule based search procedure  [7]

OR

1'(a)  List and discuss the four categories in which different definitions of AI can be organized  [6]
1'(b)  What do you mean by heuristic search? Search for a solution to the 8-puzzle using heuristic breadth first search and draw the breadth first search tree.  [9]

2(a)  Represent the following axioms in form of a formula using predicate logic and prove the formula for the conclusion using resolution.
(i) Every tree that is an Oak contains some grackle.
(ii) If anyone walks under any tree that contains any grackle then he hates every grackle.
(iii) For every building, there is some tree that is beside it.
(iv) Taylor hall is a building.
(v) Every CS student visits Taylor hall.
(vi) If anyone visits any building, then he walks under every tree that is beside that building.
(vii) (Conclusion) If some CS student does not hate some grackle, then there is some tree beside Taylor hall that is not an Oak.  [9]
2(b) Define model of a sentence. Discuss the validity and satisfiability of a sentence.

OR

2'(a) What do you mean by soundness and completeness of an inference procedure? List at least four sound inference patterns with examples.

2'(b) What do you mean by Expert Systems? Draw a block diagram to show the basic components of an expert system. List the situations when the use of expert systems is recommended and the situations when the use of expert systems is not advised.

3(a) What do you mean by an artificial neural network? List the different steps of the back propagation algorithm used to train the multi-layer feed forward network. How the training with this algorithm is different from unsupervised learning in Self Organizing Maps? Discuss clearly.

3(b) What do you mean by a rough set? How it differs from a fuzzy set? Define Core and Reduct. Find Core and Reduct for the data given in the Table 1.

4(a) Discuss the way in which a problem is solved using genetic algorithms. Show the steps that are used to solve the optimization problem- maximize \( F(x) = 3x - (x^2/10) \) for \( x \in \{0, 1, ..., 31\} \). using genetic algorithms.

4(b) Write short notes on the following

(i) PSO  (ii) ACO  (iii) n-point crossover  (iv) Memetic algorithm

<table>
<thead>
<tr>
<th>Patient</th>
<th>Headache</th>
<th>Muscle-pain</th>
<th>Temperature</th>
<th>Flu</th>
</tr>
</thead>
<tbody>
<tr>
<td>p1</td>
<td>no</td>
<td>yes</td>
<td>high</td>
<td>yes</td>
</tr>
<tr>
<td>p2</td>
<td>no</td>
<td>no</td>
<td>normal</td>
<td>no</td>
</tr>
<tr>
<td>p3</td>
<td>yes</td>
<td>yes</td>
<td>very high</td>
<td>yes</td>
</tr>
<tr>
<td>p4</td>
<td>no</td>
<td>yes</td>
<td>normal</td>
<td>no</td>
</tr>
<tr>
<td>p5</td>
<td>yes</td>
<td>yes</td>
<td>high</td>
<td>yes</td>
</tr>
<tr>
<td>p6</td>
<td>no</td>
<td>no</td>
<td>very high</td>
<td>yes</td>
</tr>
</tbody>
</table>
2015-16
B.TECH. (AUTUMN SEMESTER) EXAMINATION
COMPUTER ENGINEERING
SELECTED TOPICS IN COMPUTER ENGINEERING-I
CO-446N

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)          How to develop an algorithm? What do you mean by its complexity? [03]
1(b)          What is the need of different data structures? Why not use arrays for everything? [06]
1(c)          Write an algorithm to delete the last node from a linked list. [06]

OR

1(c')         Write the selection sort algorithm for a given array. What is its complexity? [06]

2(a)          Explain ADT with the help of a suitable example. [03]
2(b)          Define a queue. Write an algorithm to insert an element in a circular queue which is implemented using an array. [06]
2(c)          What is a binary search tree? How to represent a tree in computer memory? What will be the maximum size of a tree having depth-9? [06]

OR

2(c')         The preorder traversal of a balanced binary tree is 5, 12, 15, 9, 14, 8, 10, 7, 6, 11, 13, 4. Draw the tree. Find its inorder and postorder traversal. [06]

3(a)          What is context switch? Differentiate between short-term and long-term scheduler. [03]
3(b)          What do you mean by inter process communication? What are the advantages of it? What are the techniques used for inter process communication? [06]
3(c) Suppose that the following processes arrive for execution at the times indicated. Find the average waiting time in preemptive SJF scheduling algorithm. What is the drawback of SJF algorithm?

<table>
<thead>
<tr>
<th>Process</th>
<th>Arrival Time</th>
<th>Burst Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>P2</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>P3</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>P4</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

OR

3(c') What will be the average turnaround time for the above mentioned process in RR scheduling algorithm (Time quantum = 3)? Explain the difference between preemptive and nonpreemptive scheduling.

4(a) What is cache memory? Why is ROM used in computer system?

4(b) What is Belody’s anomaly? Explain with example.

4(c) What is the need of page replacement in memory? Briefly describe about the different page replacement algorithms. Which algorithm is the best and why?

OR

4(c') What is thrashing? How to overcome it? Differentiate between external and internal fragmentation of memory.