University of Puerto Rico Mayaguez
Department of Electrical and Computer Engineering
ICOM 4036 Spring 2004 Exam I 3/25/04

NAME: _____ **SECTION** _____

¡Anota tu nombre completo en esta página y tus iniciales en <u>todas las demás hojas</u> del examen AHORA! (penalidad de 5 puntos)

Tienes 2 horas para completar todos los problemas. Lee cuidadosamente todo el examen antes de empezar a trabajar. Muestra todo el trabajo conducente a tu contestación. Podrás recibir crédito parcial por contestaciones parciales siempre y cuando muestres tu trabajo por escrito. Usa tu tiempo inteligentemente. Exito!

ICOM 4036 Staff

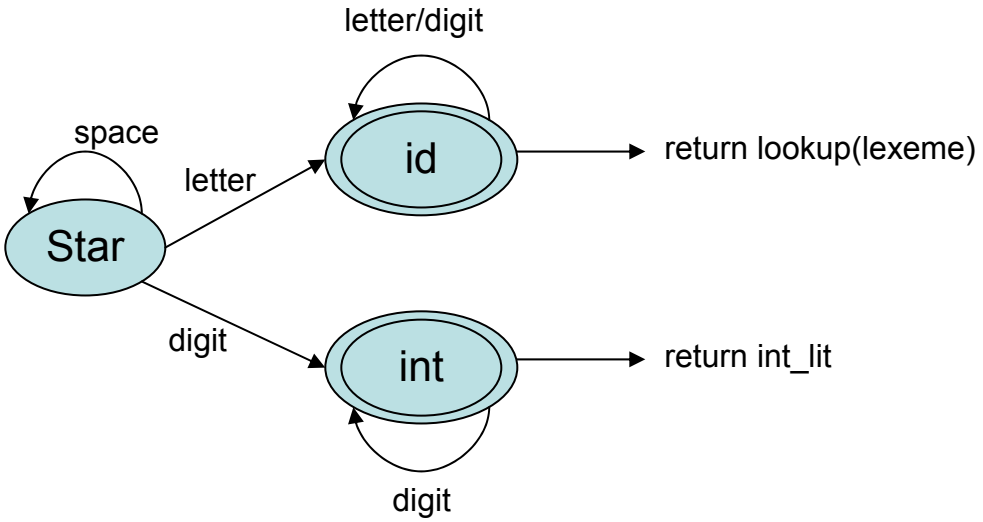
INITIALS: _____ SECTION _____

1	30
2	30
3	30
4	10
Total	100

INITIALS: _____ **SECTION** _____

Problem 1. (30 points) Lexical Analysis

Consider the following state diagram



a) (10 points) Provide the sequence of tokens that the scanner will return in response to the input string "**`x32y while20 21z`**". Assume that `while` is the only keyword in the language in question. Notice that you must consider the two space characters inside the string in your recognition of the token.

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b) (10 points) Provide a modified version of the state diagram that recognizes identifiers that may contain the underscore character '_' as long as it does not appear at the beginning or at the end of the lexeme.

c) (10 points) Modify the state diagram to recognize hexadecimal integer literals that begin with the character prefix "0x" in the style of ANSI C. The token code returned should be `hex_lit`.

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Problem 2. (30 points) Imperative programming

In class we studied an example program to compute the solution to a linear system of equations. The code is presented below:

```
SUBROUTINE SOLVE(M, N, X)
       INTEGER N
       REAL M(N, N+1), X(N)
       CALL TRIANG(M, N)
       CALL BKSUB(M, N, X)
END

SUBROUTINE TRIANG(M, N)
       INTEGER N
       REAL M(N, N+1)
       DO 100, J = 1, N-1, 1
C        ELIMINATE COEFFS OF COL J
          DO 50, I = J+1, N, 1
C           ELIMINATE COEFF M(I,J)
             DO 25, K=J, N+1, 1
                M(I,K) = << A >>
25           CONTINUE
50        CONTINUE
100    CONTINUE
END

SUBROUTINE BKSUB(M, N, X)
       INTEGER N
       REAL M(N, N+1), X(N)
       DO 300, I=N, 1, -1
C        CALCULATE X(I)
          X(I) = M(I, N+1)
          DO 250, J= << B >>
             X(I) = X(I) - M(I,J) * X(J)
250       CONTINUE
          X(I) = X(I)/M(I,I)
300    CONTINUE
END
```

a) (10 points) Provide the code missing in section **<< A >>**

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b) (10 points) Provide the code missing in section << B >>

c) (10 points) Provide a new version of the TRIANG subroutine that eliminates all the coefficients in the matrix except for the ones in the diagonal.

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Problem 3. (30 points) Syntax Analysis and Parsing

Consider the following grammar:

```
<funcall> →   id ( <args> , <args> )
          |   id ( <args> )
<args>    →   <expr>
          |   <args> , <expr>
<expr>    →   id  |  …
```

a) (10 points) Prove that the grammar is ambiguous

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b) (10 points) Provide a modified version of the grammar that recognizes exactly the same language but unambiguously.

c) (10 points) Draw a parse tree generated by the original grammar and another syntax tree generated by the unambiguous grammar that you provided in part (b) for the input statement "**f(x,y,z)**". YOU MUST DRAW 2 CORRECT PARSE TREES for full credit.

Problem 4. (10 points) Course Evaluation

Es importante que completes esta parte con la mayor seriedad e interés posibles. Tu contribución ayudará a mejorar la calidad del curso significativamente.

Gracias.

1) Menciona los tres aspectos que mas te gustan de la clase ICOM 4036

a)

b)

c)

2) Menciona los tres aspectos que menos te gustan de la clase ICOM 4036

a)

b)

c)

En una escala de 1 (poco o nada) a 5 (mucho) como consideras que el profesor ha respondido a las recomendaciones que has hecho en el pasado para mejorar el curso.

1	**2**	**3**	**4**	**5**