

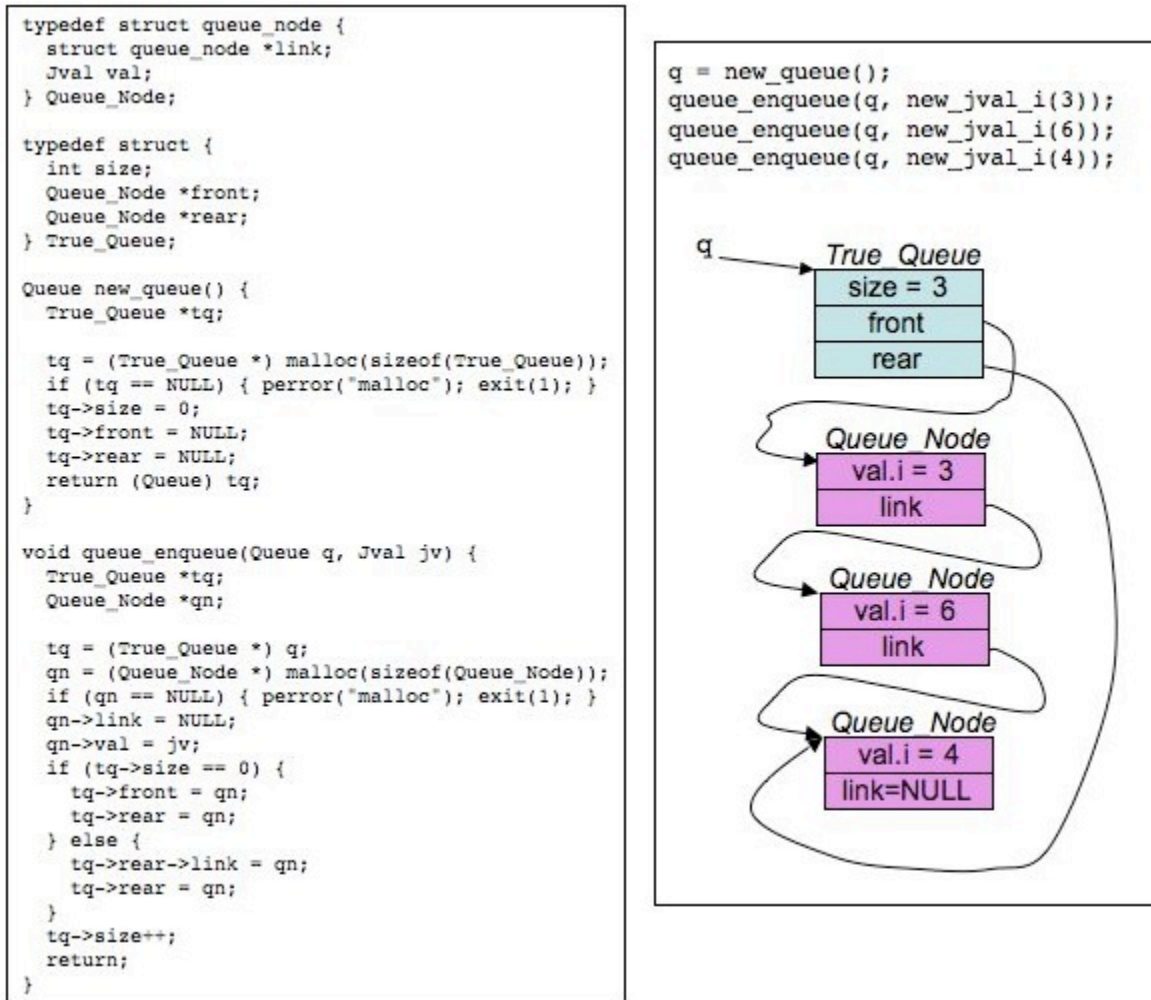
CS140 Midterm Exam - October 10, 2006

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Answer all questions. Do so on a separate sheet of paper.

Question 1

Recall the following pictorial example of an implementation of some queue operations:



Implement `queue_dequeue()`, which has the following prototype:

```
Jval queue_dequeue(Queue q);
```

Recall that `Queue` is a `(void *)`.

Question 2

Behold the following C program:

```

#include < stdio.h >
#include < string.h >

main()
{
    char *s, *s2, *x, **y;

    s = strdup("Juice-em!");
    s2 = strdup(s);

    x = strchr(s, 'e');
    y = &x;
    x[1] = '*';

    printf("0x%x 0x%x 0x%x\n",
        s, s2, y);

    printf("0x%x\n", x);
    printf("0x%x\n", &x);
    printf("0x%x\n", y);
    printf("0x%x\n", *y);
    printf("%c\n", s[1]);
    printf("%c\n", *x);
    printf("0x%x\n", &(s[1]));
    printf("%s %s %s\n",
        s, s2, x);

    *y = s2 + 2;
    *x = 'X';

    printf("0x%x\n", x);
    printf("%s %s %s\n",
        s, s2, x);
}

```

When we run this program, the first line of output is:

```
0x500120 0x500130 0xbfffed28
```

What are the remaining lines of output?

Question 3

You are to write a program **pan.c** which prints out all numeric command line arguments as decimal numbers padded to three decimal places. The program should ignore non-numeric command line arguments. For each of the following eight programs, state whether it is correct, and then state what the output of the program will be when the command line arguments are:

```
pan -43.55001 Fred 0 66.440 Luther4
```

A.

```
main(int argc, char **argv)
{
    int i; double d;

    for (i = 1; i < argc; i++) {
        d = atof(argv[i]);
        if (d != 0) printf("%.3lf\n", d);
    }
}
```

B.

```
main(int argc, char **argv)
{
    int i; double d;

    while (scanf("%lf", &d) == 1) {
        printf("%.3lf\n", d);
    }
}
```

C.

```
main(int argc, char **argv)
{
    int i; double d;

    for (i = 1; i < argc; i++) {
        if (sscanf(argv[i], "%lf", &d) == 1) {
            printf("%.3lf\n", d);
        }
    }
}
```

D.

```
main(int argc, char **argv)
{
    int i; double d;

    for (i = 1; i < argc; i++) {
        if (sscanf(argv[i], "%lf", d) == 1) {
            printf("%.3lf\n", d);
        }
    }
}
```

E.

```
main(int argc, char **argv)
{
    int i, j; double d;

    for (i = 1; i < argc; i++) {
        j = sscanf(argv[i], "%lf", &d);
        if (j == 1) printf("%.3lf\n", d);
    }
}
```

F.

```
main(int argc, char **argv)
{
    int i; double d;

    for (i = 1; i < argc; i++) {
        d = atoi(argv[i]);
        if (d != 0) printf("%.3lf\n", d);
    }
}
```

G.

```
main(int argc, char **argv)
{
    int i, j, d;

    for (i = 1; i < argc; i++) {
        j = sscanf(argv[i], "%lf", &d);
        if (j == 1) printf("%.3d\n", d);
    }
}
```

H.

```
main(int argc, char **argv)
{
    int i; double d;

    while (1) {
        i = scanf("%lf", &d);
        if (i == EOF) exit(0);
        if (i == 1) printf("%.3lf\n", d);
    }
}
```

Question 4

Behold the following file:

```

Cutie the bomb
Met her at a beauty salon
With a baby louis vuitton
Under her under arm

```

 What is the output when that file is given as standard input to the following program:

```

main()
{
    int i, j, ne;
    IS is;
    Stack s;
    Queue q;
    Jval jv;

    j = 0;
    ne = 0;
    s = new_stack();
    q = new_queue();
    is = new_inputstruct(NULL);
    while (get_line(is) >= 0) {
        for (i = 0; i < is->NF; i++) {
            if (j%3 == 0 || j%3 == 2) {
                queue_enqueue(q, new_jval_s(strdup(is->fields[i]));
                ne++;
            }
            if (j%3 == 1 || j%3 == 2) {
                stack_push(s, new_jval_i(strlen(is->fields[i]));
                ne++;
            }
            j++;
        }
    }
    while (!stack_empty(s)) {
        jv = stack_pop(s);
        printf("%d ", jv.i);
    }
    printf("\n");

    while (!queue_empty(q)) {
        jv = queue_dequeue(q);
        printf("%s ", jv.s);
    }
    printf("\n");
    printf("%d\n", ne);
    exit(0);
}

```


Prototypes

```
typedef union {
    int i;
    long l;
    float f;
    double d;
    void *v;
    char *s;
    char c;
    unsigned char uc;
    short sh;
    unsigned short ush;
    unsigned int ui;
    int iarray[2];
    float farray[2];
    char carray[8];
    unsigned char uarray[8];
} Jval;
```

```
Jval new_jval_i(int);
Jval new_jval_l(long);
Jval new_jval_f(float);
Jval new_jval_d(double);
Jval new_jval_v(/* void */);
Jval new_jval_s(char *);
```

```
char *strdup(char *s);
void strcpy(char *dest, char *source);
char *strchr(char *s, int ch);
char *strrchr(char *s, int ch);
char *strstr(char *s, char *tfind);
int getchar();
```

```
#define MAXLEN 1001
#define MAXFIELDS 1000

typedef struct inputstruct {
    char *name;
    FILE *f;
    int line;
    char text1[MAXLEN];
    char text2[MAXLEN];
    int NF;
    char *fields[MAXFIELDS];
    int file;
} *IS;

IS new_inputstruct(char *name);
int get_line(/* IS */);
void jettison_inputstruct(/* IS */);
```

```
typedef void *Queue;

Queue new_queue();
void queue_enqueue(Queue q, Jval v);
Jval queue_dequeue(Queue q, Jval v);
int queue_empty(Queue q);
```

```
typedef void *Stack;

Stack new_stack();
void stack_push(Stack s, Jval v);
Jval stack_pop(Stack s, Jval v);
int stack_empty(Stack s);
```
