

ELEKTRIJADA 2018

Bečići (Montenegro), May 19-24, 2018

INFORMATICS

Please, suppose in all tasks that Little Endian is used, and
`sizeof(int)=sizeof(int*)=sizeof(float)=4` `sizeof(long long)=sizeof(double)=8`

1 Find the output of the following program:

```
#include <stdio.h>
int f(int x)
{
    int x0=0, x1=1, y0=1, y1=x, a, b, br=0;
    do
    {
        a=(y0+x)/y1*x1-x0; b=(y0+x)/y1*y1-y0;
        x0=x1; x1=a; y0=y1; y1=b; br++;
    }
    while (a<b);
    return (--br);
}
int main()
{
    for (int i=1; i<4; i++)
        printf("%d:%d\n", i, f(4*i));
    return 0;
}
```

2 Find the output of the following program:

```
#include <stdio.h>
#include <stdlib.h>
#define P(x) printf("%c", x->c)
#define T(A,B,C,x) \
    x==3?(A,B,C):(x==2?(B,A,C):(B,C,A))
typedef struct x {char c; struct x *l,*r;} X;
X *fn(char *c)
{
    X *x = (X*) calloc(1,sizeof(X));
    return x->c=*c, x;
}
X *f0(X *s, char *c)
{
    static int k; k++;
    if (!s) return fn(c);
    if (k<<31&&*c<s->c||~k<<31&&*c>s->c)
        s->l=f0(s->l,c);
    else if (k<<31&&*c>s->c||~k<<31&&*c<s->c)
        s->r=f0(s->r,c);
    return s;
}
void f(X *s, int i)
{ if (s) T(P(s),f(s->l,i),f(s->r,i),i); }
int main()
{
    int i;
    char *c="BECICI";
    X *head = NULL;
    while (*c) head=f0(head,c++);
    for (i=1; i<4; i++)
        printf("%d:",i), f(head,i), printf("\n");
    return 0;
}
```

3 Find the output of the following program:

```
#include <stdio.h>
#include <string.h>
#define ystr(s) str(s##s)
#define xstr(s) str(s)
#define str(s) #s
#define foo 54
int main()
{
    const char *p="BECICI\n";
    const char *q="INF";
    int i;
    i = printf("01:"xstr(q)"\n");
    i = printf("02:%d\n",i);
    i = printf("03:"xstr(foo)"\n");
    i = printf("04:%d\n",i);
    i = printf("05:"str(p="BUDVA\n");)"\n");
    i = printf("06:"str(p)"\n");
    i = printf("07:%s",p);
    i = printf("08:%d\n",i);
    i = printf("09:"ystr(q)"\n");
    i = printf("10:"ystr(foo));
    return 0;
}
```

4 Find the output of the following program:

```
#include <stdio.h>

typedef signed short int SI;
struct A { SI a:1, b:4, c:2, d:7; };
struct B { SI a:1, b:4, :0, c:2, d:7; };
struct C { SI a:1, b:4, :1, c:2, d:7; };

void f(const void *p, int n)
{
    int i;
    unsigned char *pc = (unsigned char *) p;
    for (i=n-1; i>=0; i--)
        printf("%02x", *(pc+i));
    printf("\n");
}

int main()
{
    struct A a={.a=255,.b=255,.c=255,.d=255};
    struct B b={.a=255,.b=255,.c=255,.d=255};
    struct C c={.a=255,.b=255,.c=255,.d=255};
    printf("1:%x\n",a.a+b.b+c.c+d.d);
    printf("2:%d-",sizeof(a)); f(&a,sizeof(a));
    printf("3:%d-",sizeof(b)); f(&b,sizeof(b));
    printf("4:%d-",sizeof(c)); f(&c,sizeof(c));
    return 0;
}
```

5 Find the output of the following program:

```
#include <stdio.h>
typedef unsigned int U;
U f(U w[][10], U a, U b)
{
    U d[10], perm[10];
    int cc, i=0, j, k, dc, sd, nd;
    for(; i<sizeof(U); perm[i]=0, d[i++]=-1);
    perm[a]=1; d[cc=a]=0;
    for (; cc!=b; perm[cc=k]=1)
    {
        sd=-1; dc=d[cc];
        for(i=0; i<sizeof(U); i++)
            if(perm[i]==0)
            {
                nd=dc+w[cc][i];
                if(nd<d[i]) d[i]=nd;
                if(d[i]<sd) sd=d[k=i];
            }
    }
    return d[b];
}
int main()
{
    U w[10][10]={{{0,1,-1,-2},{1,0,3,-1},
                  {-1,3,0,10},{-1,-2,10,0}}};
    U pd, s, t, i, j, k;
    for (i=0; i<sizeof(U); i++)
    {
        U x=0;
        for (j=0; j<sizeof(U); x+=f(w,i,j),j++);
        printf("%d:%d\n", i,x);
    }
    return 0;
}
```

6 Find the output of the following program:

```
#include <stdio.h>
#include <stdarg.h>
int f(const void *a, const void *b, ...)
{
    int res;
    va_list x; va_start(x,b);
    switch (va_arg(x,int)) {
        case 1: res = *(char*)a**(char*)b;
        case 2: res = *(char*)a<*(char*)b; }
    va_end(x); return res;
}
char *g(char *q, int k)
{
    int i, j, h; char x;
    for (h=sizeof(q)/2; h>0; h/=2)
        for (i=h; i<sizeof(q); j[q]=x,i++)
            for (x=(j=i)[q]; j>=h&&f(&x,&(j-h)[q],k);)
                j[q]=(j-h)[q], j-=h;
    return q;
}
int main()
{
    char j=0, c[]="INFORMATICS";
    for (; ++j<3; ) printf("%d:%s\n",j,g(c,j));
    return 0;
}
```

7 Find the output of the following program:

```
#include <stdio.h>
void f0(char *s, int i, char *c)
{
    if (*(s+i-1)) *(s+i-1)=*c;
    else if (*c>*(s+i-1)&&2*i+1<32)
        f0(s,2*i,c);
    else if (*c<*(s+i-1)&&2*i+1<32)
        f0(s,2*i+1,c);
}
void f1(char *s, int i, int t)
{
    int j=0, k=0;
    for (; j<32; j++, s++, t++)
        if (*s&&++k<3) printf("%c", *s);
}
void f(char *s, int i, int t)
{
    static int k;
    if (*(s+i-1)||k>3) return;
    if (t==2)
    {
        printf("%c", *(s+i-1)); k++;
        if (2*i+1<32) f(s,2*i,t), f(s,2*i+1,t);
    }
    else if (t==3)
    {
        if (2*i+1<32) f(s,2*i,t);
        printf("%c", *(s+i-1)); k++;
        if (2*i+1<32) f(s,2*i+1,t);
    }
    else
    {
        if (2*i+1<32) f(s,2*i,t), f(s,2*i+1,t);
        printf("%c", *(s+i-1)); k++;
    }
    k=0;
}
int main()
{
    int i;
    char *c="BECICI", s[100]={};
    void (*g[])(char*,int,int) = {f1,f};
    void (**h)(char*,int,int) = g;
    while (*c) f0(s,1,c++);
    for (i=1; i<5; i++)
    {
        printf("%d:",i);
        (**h)(s,1,i); if (i==1) h++;
        printf("\n");
    }
    return 0;
}
```

Points/Task Distribution

1	2	3	4	5	6	7	Σ
15	15	10	10	20	10	20	100