ELEKTRIJADA 2022

Sunny Beach (Bulgaria), May 15-20, 2022

INFORMATICS

Please, suppose that Little Endian is used in all tasks, and IEEE-754 is used for FP data, and sizeof(short)=2 sizeof(int)=sizeof(int*)=sizeof(float)=4 sizeof(long long)=sizeof(double)=8

❶ Find the output of the following program:

```
#include <stdio.h>

char f1(const char *s)
{
   return *s?!!*s+f1(++s):*s^*s;
}

char *f2(char *s1, char *s2)
{
   for (int i; i=f1(s2); s1[--i]=*s2++);
   return s1;
}

int main()
{
  char s1[][20]={"TOP", "BOTTOM"},
       s2[][20]={"DOWN", "UP"};
  for (int i=0; i<2; i++)
  {
    printf("%d:%d\n", i, f1(f2(s1[i],s2[i])));
    printf("%s\n", f2(s2[i],f2(s1[i],s2[i])));
  }
  return 0;
}
```

❷ Find the output of the following program:

```
#include <stdio.h>

void f1(char *s, char c)
   { for (;*s=*s++;); *--s=c; }

void f2(char *s)
   { for (;*s;*s^=*s++); }

int main()
{
   char s[20]="";
   int niz[4]={[2]=2};
   int i=0,j=0;
   for (;++i<3;)
      niz[i]=niz[i-1]+++niz[i+1];

   for (;j<4;j++)
      printf("%d:%d\n", j, niz[j]);

   for (i=0; i<4; i++)
      switch (niz[i]%3)
      {
         default:
           printf("%d:%s\n", j++, s), f2(s);
         case 1:
           f1(s,niz[i]|0x40);
         case 2:
           f1(s,niz[i]|0x30);
      }
   return 0;
}
```

❸ Find the output of the following program in case of its successful execution:

```
#include <stdio.h>
#include <stdlib.h>

typedef struct node
               { char c; struct node *p; }
               NODE;

int fp1(NODE **p, char *c)
{
   NODE *q = (NODE*)calloc(1,sizeof(NODE));
   if (!q) return 0;
   q->c=*c; q->p=*p; *p=q;
   return 1;
}

int fp2(NODE **p, char *c)
{
   NODE *q = *p;
   if (!q) return 0;
   *c=q->c; *p=q->p; free(q);
   return 1;
}

char *fss(const char *a)
{
   NODE *ts1=NULL, *ts2=NULL;
   int i, j;
   char c;
   for (i=0; *(a+i); i++)
   {
     while ((ts1) && (ts1->c>i[a]))
       if (fp2(&ts1,&c))
         fp1(&ts2,&c);
     while ((ts2) && (ts2->c<i[a]))
       if (fp2(&ts2,&c))
         fp1(&ts1,&c);
     fp1(&ts1,a+i);
   }
   for (i=0; ts2; fp2(&ts2,&c),i++);
     printf("%o-%o\n", i,c);
   for (i=0; ts1; fp2(&ts1,&c),i++);
     printf("%x-%x\n", i,c);
}

int main()
{
   char *p[2]={"ELEKTRIJADA", "SUNNY BEACH"};
   for (int i=0; i<sizeof(p)/sizeof(*p); i++)
      fss(*p+i);
   return 0;
}
```

❹ **Find the output of the following program:**

```
#include <stdio.h>
#include <string.h>
#define M(x) d[x],strlen(d[x])
#define F(x,y) fl(M(x),M(y))

int fl(char *s, int ls, char *t, int lt)
{
  int a,b,c;
  if (!ls) return lt;
  if (!lt) return ls;
  if (s[ls-1]==t[lt-1])
    return fl(s,ls-1,t,lt-1);
  a=fl(s,ls-1,t,lt-1);
  b=fl(s,ls,t,lt-1);
  c=fl(s,ls-1,t,lt);
  if (a>b) a=b;
  if (a>c) a=c;
  return a+1;
}

int main()
{
  char d[][10]={"SUNDAY", "MONDAY",
        "TUESDAY", "WEDNESDAY", "THURSDAY",
        "FRIDAY", "SATURDAY"};
  for (int i=1; i<7; i+=2)
    printf("%c-%c %d\n",
           *d[i],*d[i-1],F(i,i-1));
  return 0;
}
```

❺ **Find the output of the following program:**

```
#include <stdio.h>
typedef struct { int d, n; } F;
int c;
F ff(int n)
{
   F f1={.n=1}, f2={1,n}, f;
   int k;
   c=2;
   while (f2.n>1)
   {
      k=(n+f1.n)/f2.n;
      f=f1;
      f1=f2;
      f2=(F){f2.d*k-f.d,f2.n*k-f.n};
      c++;
   }
   return f1;
}

int main()
{
   F f;
   f=ff(4);
   printf("%d-%d-%d\n", f.d,f.n,c);
   f=ff(8);
   printf("%d-%d-%d\n", f.d,f.n,c);
   return 0;
}
```

❻ **Find the output of the following program:**

```
#include <stdio.h>
int b;

int fbc(int n)
{ return n?1+fbc(n/b):0; }

int fc(int n, int bc)
{
  int x=fbc(n)-bc;
  while (--x) n/=b;
  return n%b;
}

int fl(int b1, int b2)
{
  int ls=fbc(b1), lt=fbc(b2);
  int d[ls+1][lt+1];
  for (int i=0; i<=ls; i++)
    for (int j=0; j<=lt; j++) d[i][j]=-1;

  int fd(int i, int j)
  {
    int x,y;
    if (d[i][j]>=0) return d[i][j];
    if (i==ls) x=lt-j;
    else if (j==lt) x=ls-i;
    else if (fc(b1,i)==fc(b2,j))
      x=fd(i+1,j+1);
    else
    {
      x=fd(i+1,j+1);
      if ((y=fd(i,j+1))<x) x=y;
      if ((y=fd(i+1,j))<x) x=y;
      x++;
    }
    return d[i][j]=x;
  }

  return fd(0,0);
}

int main()
{
  for (b=2; b<5; b++)
    printf("%d-%d\n", b, fl(20,40));
  return 0;
}
```

❼ **Find the output of the following program:**

```
#include <stdio.h>

unsigned f1(float f)
{
   union un {float f; unsigned u} u={.f=f};;
   printf("f1:%x\n",u.u);
   return u.f;
}

int main()
{
   printf("main:%u\n",f1(3.5e0));
   f2(3.5e0);
   return 0;
}

void f2(int d) { printf("f2:%d\n", d); }
```

❽ Find the output of the following program:

```
#include <stdio.h>
void fp1(short a[][2], int n, int m)
{
  for (int i=-1, j; ++i<n;)
    for (j=-1; ++j<m; printf("%d",a[i][j]));
}
void fp2(short a[][3], int n, int m)
{
  for (int i=n, j; --i;)
    for (j=m; --j; printf("%d",a[i][j]));
}
void fp3(int a[2][2], int n, int m)
{
  for (int i=n, j; --i;)
    for (j=m; --j; printf("%d",a[i][j]));
}
int main()
{
  short s[5][5]={}, *ps=&s, xs=01;
  for (; ps<=s+1; *ps++=ps-(short*)s);
  printf("f1:"); fp1(s,2,2); printf("\n");
  printf("f2:"); fp2(s,3,3); printf("\n");
  printf("f3:"); fp3(s,2,2); printf("\n");
  return 0;
}
```

❾ Suppose that a project contains the following three source files, and find the output of the corresponding executable:

```
/* file: main.c */

#include <stdio.h>
extern void sender(int);
extern int receiver(int);
int main()
{
   for (int n=5; n<=10; n+=5)
   {
      sender(n);
      printf("%d:%d\n", n, receiver(n));
   }
   return 0;
}
```

```
/* file: sender.c */

int fbc(int n) { return n?1+fbc(n/2):0; }
static int buffer[100], res;
void sender(int n)
{
   for (int i=0; i<n; i++) buffer[i]=fbc(i);
}
```

```
/* file: receiver.c */

static int buffer[100], i, s;
int receiver(int n)
{
   for (;i<n; s+=buffer[i++]);
   return s;
}
```

Points/Task Distribution

❶	❷	❸	❹	❺	❻	❼	❽	❾	Σ
12	10	14	12	14	12	8	10	8	100

Appendix: ASCII table

	0	1	2	3	4	5	6	7
0	NUL	DLE	space	0	@	P	`	p
1	SOH	DC1 XON	!	1	A	Q	a	q
2	STX	DC2	"	2	B	R	b	r
3	ETX	DC3 XOFF	#	3	C	S	c	s
4	EOT	DC4	$	4	D	T	d	t
5	ENQ	NAK	%	5	E	U	e	u
6	ACK	SYN	&	6	F	V	f	v
7	BEL	ETB	'	7	G	W	g	w
8	BS	CAN	(	8	H	X	h	x
9	HT	EM	)	9	I	Y	i	y
A	LF	SUB	*	:	J	Z	j	z
B	VT	ESC	+	;	K	[	k	{
C	FF	FS	,	<	L	\	l	|
D	CR	GS	-	=	M	]	m	}
E	SO	RS	.	>	N	^	n	~
F	SI	US	/	?	O	_	o	del