

10 IONet - I/O & Network Programing Aneka Soal Ujian Sistem Operasi A. Wibisono (AW), C. BinKadal (CB) H. Kurniawan (HK)

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1. **2016-1a**

Circle or cross: "T" if True – "F" if False.

- **T** / **F** A bus is a CPU system that transfers data between components inside a computer, or between computers (WIKI).
- **T** / **F** Port-mapped I/O uses the same address bus to address both memory and I/O devices (WIKI).
- **T** / **F** The kernel I/O subsystem is the largest part of a kernel system (Silber9).
- **T / F** Performance can be improved by utilizing dedicated hardware and hard-coded algorithms (Silber9).
- **T** / **F** Embedded algorithms in a device controller could conflict with the applications, causing decreased performance (Silber 9).
- **T** / **F** Polling for an I/O completion can waste a large number of CPU cycles if the processor iterates a busy-waiting loop many times before the I/O completes (Silber9).
- T / F DMA (Direct Memory Access) increases system concurrency (Silber9).
- **T** / **F** The STREAMS driver modifies the flow of data between the user interface and the driver (Silber9).
- **T** / **F** Device driver encapsulate device details to avoid uniform device-access interface to I/O subsystem (Silber9).
- **T** / **F** An asynchronous process suspended until I/O completed (Silber9).

2. **2016-1b**

Lingkari atau beri silang huruf " \mathbf{B} " jika betul, dan " \mathbf{S} " jika salah.

```
001 /* (c) 2015-2019 Rahmat M. Samik-Ibrahim
002 * R: 27-Feb-2019 -- This is free software */
004 #include <stdio.h>
005 #include <string.h>
006 #include <unistd.h>
007 #include <fcntl.h>
008 #include <sys/types.h>
009 #include <sys/stat.h>
010
011 char *string = "ABCD\n";
012 void main(void) {
013
       int
             fileDescriptor;
014
       close(STDOUT_FILENO);
015
       fileDescriptor = open ("output.txt", O_RDWR|O_CREAT|O_TRUNC, 0644);
                       "%s", string);
016
       printf (
017
       write(fileDescriptor, string, strlen(string));
018 }
```

- **B** / **S** Tanpa baris 004 009, program akan tetap dapat dikompilasi tanpa kesalahan (error).
- **B** / **S** Pointer "string" (baris 011) merupakan variabel global.
- **B** / **S** Deklarasi "main(void)" (baris 12) artinya: tidak ada "passing argument" ke dalam fungsi main().
- **B / S** Pada saat program dieksekusi, secara otomatis file descriptor dari streams stdin=0 (STDIN_FILENO), stdout=1 (STDOUT_FILENO), dan stderr=2 (STDERR_FILENO).
- **B** / **S** Baris 14 akan menutup stream STDOUT_FILENO (1).
- **B** / **S** Nilai "fileDescriptor" = 1 (baris 15), akibat baris no 14.
- **B** / **S** Jika berkas "output.txt" tidak ada (baris 15), maka fungsi open() akan membuat berkas "output.txt" baru.
- **B / S** Jika sudah ada berkas "output.txt" (baris 15), maka fungsi open() akan membuka berkas dengan mode menambah (append).
- **B** / **S** Fungsi "printf()" (baris 16) akan menulis "ABCD\n" ke layar monitor.

Isi semula berkas "output.txt" ialah "XXXX\n"; maka setelah program dieksekusi akan berisi:

1	1	I	I		I					l		
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1	1	I	I		I					l		
1	1	I	I		I					l		
1	1	l	l		l							

									C Pro	gram	ing										
001 /	/*								02	0 sta	tic cha	ır* str	1 = "A	.ABB\n"	;						
002	* (c)	2017 R	ahmat	M. Sam	ik-Ibr	ahim -	_		02	1 sta	tic cha	r* str	2 = "0	CDD\n"	;						
		This i	s free	softw	are				02	2 sta	tic cha	r* str	3 = "E	EFF\n"	;						
003	* REVO	0 Thu	Mar 30	16:56	:54 WI	B 2017			02	3											
004	* STAR	T Thu	Mar 30	16:56	:54 WI	B 2017			02	4 voi	d main((void)	{								
005	*								02	5	int fd1	, fd2,	fd3;								
006	* fd2=	dup(fd	l1) du	plicat	es fd1	to fd	2		02	6	/* STDI	N=0, S	TDOUT=	1, STD	ERR=2,	theref	ore				
007	* O_RD	WR Ope	n the	file s	o that	it ca	n be r	ead	02	7	fd1,	fd2,	fd3 w	ill be	3, 4,	and 5	*/				
from and written to.										028 fd1 = open (FILE, O_TRUNC O_RDWR O_CREAT, 0644);											
008 * O_TRUNC Initially clear all data from the file.										029 fd2 = open (FILE, O_TRUNC O_RDWR O_CREAT, 0644);											
009 * O_CREAT If the file does not exist, create it.										030 fd3 = dup(fd2);											
010 */							03	1	printf(("fd1=%	d, fd2	!=%d, f	d3=%d\	n", fd1	, fd2,	fd3);					
011									03	2	write(f	d1, st	r1, st	rlen(s	tr1));						
011 012 #include <stdio.h> 013 #include <unistd.h></unistd.h></stdio.h>							03	033 write(fd2, str2, strlen(str2));													
013 #	#includ	e <uni< td=""><td>std.h></td><td></td><td></td><td></td><td></td><td></td><td>03</td><td>4</td><td>write(f</td><td>d3, st</td><td>r3, st</td><td>rlen(s</td><td>tr3));</td><td></td><td></td><td></td><td></td></uni<>	std.h>						03	4	write(f	d3, st	r3, st	rlen(s	tr3));						
014 #	#includ	e <sys< td=""><td>/types</td><td>.h></td><td></td><td></td><td></td><td></td><td>03</td><td>5</td><td>close(f</td><td>d1);</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></sys<>	/types	.h>					03	5	close(f	d1);									
015 #	#includ	e <sys< td=""><td>/stat.</td><td>h></td><td></td><td></td><td></td><td></td><td>03</td><td>6</td><td>close(f</td><td>d2);</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></sys<>	/stat.	h>					03	6	close(f	d2);									
016 #	#includ	e <fcn< td=""><td>tl.h></td><td></td><td></td><td></td><td></td><td></td><td>03</td><td>7</td><td>close(f</td><td>d3);</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></fcn<>	tl.h>						03	7	close(f	d3);									
017 #	#includ	e <str< td=""><td>ing.h></td><td></td><td></td><td></td><td></td><td></td><td>03</td><td>8 }</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></str<>	ing.h>						03	8 }											
018 #	define#	FILE	"uts20	17-1.t	xt"																
Drog	ram O	utnut	(Line (031).																	
Trog		սւբաւ	(Line (J J 1).				I				1	1	1							
Cont	ent of	file "u	ts2017	-1.txt"	,																

4. 2017-2

```
C Programing I/O
001 /*
                                                          015 #include <sys/stat.h>
002 * (c) 2017 Rahmat M. Samik-Ibrahim
                                                         016 #include <fcntl.h>
003 * http://rahmatm.samik-ibrahim.vlsm.org/
                                                         017 #include <string.h>
004 * This is free software.
                                                         018 #define FILE "file.txt"
005 * REV00 Wed Oct 18 18:20:27 WIB 2017
                                                         019
006 * START Wed Oct 18 18:20:27 WIB 2017
                                                         020 void main(void) {
                                                         021
                                                                 int fd1, fd2;
008 write (fd, "string", string_lenght);
                                                         022
                                                                 fd1 = open (FILE, O_RDWR | O_CREAT | O_TRUNC, 0644);
                                                                fd2 = dup(fd1);
009 duplicate = dup (fd);
                                                         023
010 */
                                                                write (fd1, "012345\n", 5);
                                                         024
011
                                                          025
                                                                 write (fd2, "abcdef\n", 5);
012 #include <stdio.h>
                                                          026
                                                                 close(fd1);
                                                         027
013 #include <unistd.h>
                                                                 close(fd2);
014 #include <sys/types.h>
                                                         028 }
Inside FILE (file.txt)
```

5. **2018-1**

```
001 /*
002 Copyright 2018 Rahmat M. Samik-Ibrahim
003 You are free to SHARE (copy and
004 redistribute the material in any medium
005 or format) and to ADAPT (remix,
006 transform, and build upon the material
007 for any purpose, even commercially).
008 This program is distributed in the hope
009 that it will be useful, but WITHOUT ANY
010 WARRANTY; without even the implied
011 warranty of MERCHANTABILITY or FITNESS
012 FOR A PARTICULAR PURPOSE.
013
014 * REV03 Fri May 18 20:17:20 WIB 2018
015 * REV01 Wed Apr 18 19:50:01 WIB 2018
016 * START Thu Mar 30 16:56:54 WIB 2017
017
    * fd2 = dup(fd1) duplicates fd1 to fd2
018
      dprintf(fd,...)=printf(...) to fd
    * O_RDWR
               Open the file so that it can
019
020
               be read from and written to.
021
    * O_TRUNC Initially clear all data from
022
               the file.
023 * O_CREAT If the file does not exist,
024
               create it.
025
    */
```

```
027 #include <stdio.h>
028 #include <unistd.h>
029 #include <fcntl.h>
030 #include <string.h>
031 #define FLAGS O_RDWR|O_TRUNC|O_CREAT
032 #define FILE "demo-file.txt"
033
034 static char* str1 = "AAAAAAAAA";
035 static char* str2 = "BBBBB";
036
037 void main(void) {
       int fd1, fd2, fd3;
038
039
       /* STDIN=0, STDOUT=1, STDERR=2,
040
          fd1,fd2,fd3 will be 3,4,and 5 */
041
       fd1=open(FILE, FLAGS, 0644);
       fd2=open(FILE, FLAGS, 0644);
042
043
       fd3=dup(fd1);
044
       dprintf(fd1,"%s",
                                str1);
       dprintf(fd2,"%d %d %d ",fd1,fd2,fd3);
045
046
       dprintf(fd3,"%s",
                                str2);
047
       close(fd1);
048
       close(fd2);
049
       close(fd3);
050 }
```

Content of file "demo-file.txt" (One character per box):

001 // FILE: 40-io.c ========

```
6. 2018-2
```

```
019 #define FILE3 "zdemo3.txt"
002 // Copyright (C) 2018 Rahmat M. Samik-Ibrahim.
                                                      020 #define FILE4 "zdemo4.txt"
003 /* You are free to SHARE (copy and redistribute the mate-
                                                      021
rial in any medium or format) and to ADAPT (remix, transform, and
                                                      022 void main(void) {
build upon the material for any purpose, even commercially). This
                                                      023
                                                              int fd3 = open (FILE3,FLAGS,MODES);
program is distributed in the hope that it will be useful, but WITH-
                                                      024
                                                              int fd4 = open (FILE4,FLAGS,MODES);
OUT ANY WARRANTY; without even the implied warranty of MER-
                                                              dprintf(fd3, "fd%d\n", fd3);
                                                      025
CHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. */
                                                              dprintf(fd4, "fd%d\n", fd4);
                                                      026
                                                      027
                                                              close(STDOUT_FILENO); // STDOUT = 1
007 // REV03 Sun Dec 16 22:10:40 WIB 2018
                                                      028
                                                              int fd1 = dup(fd3);
008 // START Thu Dec 12 19:55:08 WIB 2018
                                                      029
                                                              close(STDERR_FILENO); // STDERR = 2
009
                                                              int fd2 = dup(fd4);
                                                      030
010 #include <fcntl.h>
                                                      031
                                                              dprintf(fd1, "fd%d\n", fd1);
011 #include <stdio.h>
                                                      032
                                                              dprintf(fd2, "fd%d\n", fd2);
012 #include <unistd.h>
                                                              close (fd1);
                                                      033
013 #include <sys/types.h>
                                                              close (fd2);
                                                      034
014 #include <sys/stat.h>
                                                      035
                                                              close (fd3);
015
                                                      036
                                                              close (fd4);
016 #define MODES 0644
```

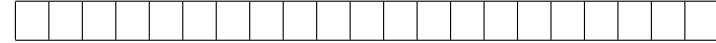
Content of file "zdemo3.txt" (One character per box):

017 #define FLAGS O_RDWR|O_CREAT|O_TRUNC



037 }

Content of file "zdemo4.txt" (One character per box):



7. 2019-1 (82.3%)

```
001 // (c) 2019 This is Free Software R01
                                                  016 void main(void) {
002 // Rahmat M. Samik-Ibrahim 20190515-12:40
                                                  017
                                                         int fd1=open(FILE,
003 //
                                                          O_CREAT|O_TRUNC|O_RDWR, 0644);
004
                                                         int fd2=open(FILE,
                                                  018
005 #include <fcntl.h>
                                                          O_CREAT|O_TRUNC|O_RDWR, 0644);
006 #include <stdio.h>
                                                  019
                                                         int fd3=open(FILE,
007 #include <sys/stat.h>
                                                          O_CREAT|O_TRUNC|O_RDWR, 0644);
008 #include <sys/types.h>
                                                         write (fd1,STRING1, 9);
                                                  020
009 #include <unistd.h>
                                                  021
                                                         write (fd2,STRING2, 6);
010
                                                  022
                                                         write (fd3,STRING3, 3);
011 #define FILE
                    "file.txt"
                                                  023
                                                         close(fd1);
012 #define STRING1 "AAABBBCCC"
                                                  024
                                                         close(fd2);
013 #define STRING2 "DDDEEEFFF"
                                                  025
                                                         close(fd3);
014 #define STRING3 "GGGHHHIII"
                                                  026 }
```

Content of file "file.txt" (One character per box):

				l					l			i I	
				l					l			i I	
1				l								i I	
				l					l			i I	

8. **2019-2** (55%)

```
001 // (c) 2019 This is Free Software R01
002 // Rahmat M. Samik-Ibrahim 20191216-1555
003 // R01 1217 2000
                                                 016 void main(void) {
004
                                                        printf ("OUT=%d\n", STDOUT_FILENO);
                                                 017
005 // File Name: 76-192.c
                                                 018
                                                        close(STDOUT_FILENO);
006 // To run: ./76-192
                                                        int fd1 = open (FILE1, O_RDWR |
                                                 019
007
                                                                   O_CREAT | O_TRUNC, 0644);
                                                 020
008 #include <stdio.h>
                                                 021
                                                        int fd2 = dup2(fd1, 9);
009 #include <unistd.h>
                                                 022
                                                        printf(
                                                                         "A\n");
010 #include <sys/types.h>
                                                 023
                                                        fprintf(stdout, "B\n");
011 #include <sys/stat.h>
                                                        dprintf(fd2,
                                                                        "fd1=%d\nfd2=%d\n",
                                                 024
012 #include <fcntl.h>
                                                 025
                                                                                  fd1, fd2);
013 #include <string.h>
                                                 026 }
014 #define FILE1 "zdemo1.txt"
```

Content of file "zdemo1.txt" (One character per box):