

# 過去問題の解説

Commentary on past issues



**Q1.** For logical variables  $A$  and  $B$ , which of the following is equivalent to the NOR operation on  $A$  and  $B$ ? Here,  $A + B$ ,  $A \cdot B$ , and  $\bar{A}$  are OR, AND, and NOT operations on the corresponding variables, respectively.

- a)  $\bar{A} \cdot (A + \bar{B})$       b)  $\bar{A} \cdot (\bar{A} + \bar{B})$       c)  $B \cdot (A + \bar{B})$       d)  $\bar{B} \cdot (\bar{A} + \bar{B})$

**Q2.** For non-negative integer  $A$ , which of the following has the same value as  $(A \bmod 32) + 64$ ?

Here,  $\bmod$ ,  $+$ , AND, and OR are remainder-after-division, arithmetic addition, bitwise-AND, and bitwise-OR operators, respectively.

- a)  $(A \text{ AND } 31) \text{ OR } 64$
- c)  $(A \text{ OR } 31) \text{ AND } 64$

- b)  $(A \text{ AND } 32) \text{ OR } 32$
- d)  $(A \text{ OR } 64) \text{ AND } 32$

**Q4.** Which of the following is an expression in reverse Polish notation that has the same value as the expression below when evaluated? Here, numbers are given as decimals, and the symbols  $-$  and  $\times$  are subtraction and multiplication operators, respectively.

$$3 \ 4 \ - \ 5 \ \times$$

a)  $3 \ 4 \ 5 \ \times \ -$

b)  $4 \ 5 \ - \ 3 \ \times$

c)  $5 \ 3 \ 4 \ - \ \times$

d)  $5 \ 4 \ 3 \ - \ \times$

逆ポーランド記法とは、数式などを記述する際の表記法の一つで、演算子を被演算子（演算対象）の列の後に記す方式。ポーランド記法（前置記法）を逆順にしたものであるためこのように呼ばれる。

**Q5.** The table below shows state transition for character string inspection. During the inspection, if the state changes to  $E$ , the string under inspection is rejected. Which of the following is rejected in this inspection? Here, state  $A$  is the initial state, strings are inspected from left to right, and symbol  $\Delta$  indicates a blank character.

		Character				
		Blank	Number	Sign	Radix point	Other
Current state	$A$	$A$	$B$	$C$	$D$	$E$
	$B$	$A$	$B$	$E$	$D$	$E$
	$C$	$E$	$B$	$E$	$D$	$E$
	$D$	$A$	$E$	$E$	$E$	$E$

a) +0010

b) -1

c) 12.2

d) 9. $\Delta$

**Q7.** For two-dimensional integer array  $A$ , whose  $(i, j)$ -th element  $A[i, j]$  is  $2 \times i + j$ , what is the value of element  $A[A[1, 1] \times 2, A[2, 2] + 1]$ ?

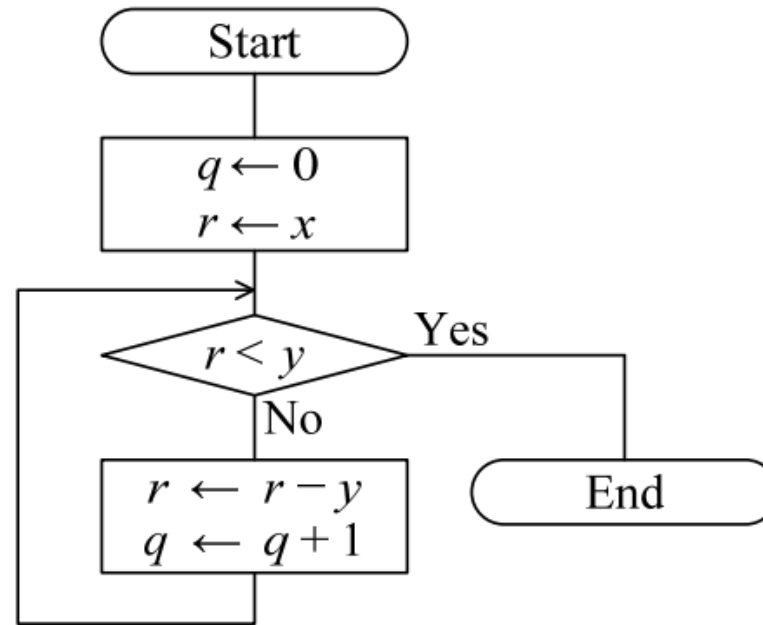
a) 12

b) 13

c) 18

d) 19

**Q8.** For two non-negative integers  $x$  and  $y$ , which of the following is the result of the procedure shown in the flowchart below?



	Value of $q$	Value of $r$
a)	Quotient of $x \div y$	Remainder of $x \div y$
b)	Quotient of $y \div x$	Remainder of $y \div x$
c)	Remainder of $x \div y$	Quotient of $x \div y$
d)	Remainder of $y \div x$	Quotient of $y \div x$

**Q10.** When the Bubble sort algorithm is used, how many exchange operations are required to sort the numbers in ascending order?

9, 2, 13, 21, 3, 0

a) 7

b) 8

c) 9

d) 10

バブルソートはリストにおいて隣り合うふたつの要素の値を比較して条件に応じた交換を行う整列アルゴリズムです。



**Q11.** Which of the following is the average cycles per instruction (CPI) of a computer that can execute 1 billion instructions per second at a clock rate of 2.4 GHz?

a) 0.04

b) 0.12

c) 2.4

d) 25

**Q12.** What is the approximate average access time in milliseconds (ms) of a magnetic disk with the specifications shown in the table below? Approximate average access time is the sum of average seek time, track-to-track seek time, and average rotational delay. Here, the controller overhead can be ignored.

Average seek time	7.5 ms
Track to track seek time	1.2 ms
Rotational speed	7,200 rpm

- a) 11.67                      b) 12.87                      c) 15.83                      d) 25.

**Q13.** Which of the following is the list that contains  $A$  through  $D$  sorted starting with the shortest effective access time of the main memory?

	Cache memory			Main memory
	Does the system have cache memory? (yes/no)	Access time (nanoseconds)	Hit rate (%)	Access time (nanoseconds)
$A$	No	-	-	15
$B$	No	-	-	30
$C$	Yes	20	60	70
$D$	Yes	10	90	80

a)  $A, B, C, D$

b)  $A, D, B, C$

c)  $C, D, A, B$

d)  $D, C, A, B$

**Q14.** A 12-point character is to be displayed on a 96-dpi display in bitmap. How many dots is the height of a square font? Here, 1 point is  $1/72$  inch.

a) 8

b) 9

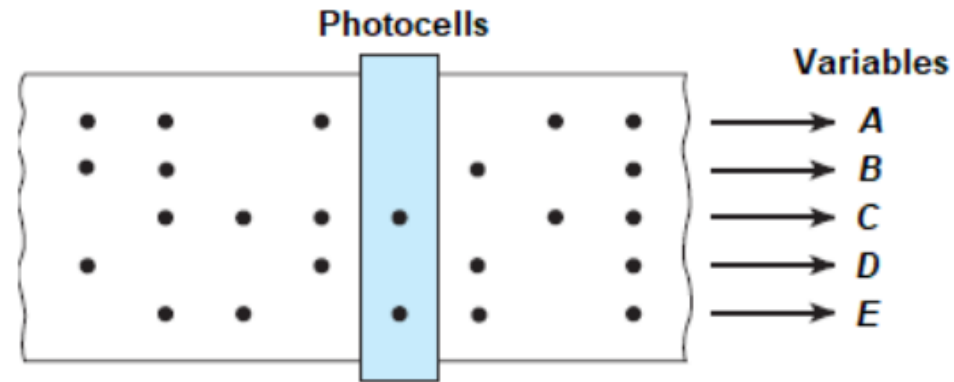
c) 12

d) 16

- Q16.** Which of the following is the system configuration that has the highest availability? Here, when systems are connected in parallel, the systems are considered to be operational if at least one (1) of them is operating.
- a) A single system with an availability of 99%
  - b) Four (4) identical systems, each with an availability of 70%, are connected in parallel.
  - c) Three (3) identical systems, each with an availability of 80%, are connected in parallel.
  - d) Two (2) identical systems, each with an availability of 90%, are connected in parallel.



**Q22.** A paper tape reader used as a computer input device reads a tape with five rows of holes as shown below. A hole punched in the tape indicates logic 1, and no hole indicates logic 0. As each hole pattern passes under the photocells, the pattern is translated into logic signals as a variable: *A*, *B*, *C*, *D*, or *E*. A valid pattern on the tape has at least one hole, and an invalid pattern has no hole or all five holes punched. Which of the following is a logical expression that has logic 1 when a valid pattern is being read and logic 0 when an invalid pattern is being read? Here, + represents logical OR, • represents logical AND, and  $\bar{A}$  represents the negation of *A* in the logic expression. In the figure, • represents a punched hole on the tape.



- a)  $\overline{(A \cdot B \cdot C \cdot D \cdot E)} + (A \cdot B \cdot C \cdot D \cdot E)$   
 b)  $(A + B + C + D + E) \cdot (\bar{A} + \bar{B} + \bar{C} + \bar{D} + E)$   
 c)  $(\bar{A} \cdot \bar{B} \cdot \bar{C} \cdot \bar{D} \cdot \bar{E}) + \overline{(A + B + C + D + E)}$   
 d)  $\overline{(A \cdot B \cdot C \cdot D \cdot E)} + (\bar{A} \cdot \bar{B} \cdot \bar{C} \cdot \bar{D} \cdot \bar{E})$

**Q26.** Which of the following is a clause that is inserted into blank *A* of the SQL statement that calculates the average scores for each class and each subject from the “MidtermTest” table, and displays them in ascending order of class and subject?

MidtermTest (Class, Subject, StudentNumber, Name, Score)

[SQL statement]

```
SELECT Class, Subject, AVG(Score) AS AverageScore  
FROM MidtermTest
```

- a) GROUP BY Class, Subject ORDER BY Class, AVG(Score)
- b) GROUP BY Class, Subject ORDER BY Class, Subject
- c) GROUP BY Class, Subject, StudentNumber  
ORDER BY Class, Subject, AverageScore
- d) GROUP BY Class, AverageScore  
ORDER BY Class, Subject, AverageScore

**Q31.** Audio data of 2.4 Mbytes encoded at 192 kbit/s is to be downloaded and played back without interruptions over a network with a communication speed of 128 kbit/s. What is the minimum number of seconds required as the data buffering time before the start of playback?

a) 50

b) 100

c) 150

d) 250

**Q32.** There exists a system that connects a head office to a factory via a leased line and sends form data. The size of each form is 2,000 bytes, and header data totaling 400 bytes is attached to every two (2) forms to be sent through this system. On average, 100,000 forms per hour are generated. When the line speed is 1 Mbit/s, what is the line's utilization rate in percentage?

a) 6.1

b) 44

c) 49

d) 53

**Q33.** In IPv4, what is the maximum number of IP addresses that can be assigned to hosts in the network of 172.16.64.0/23? Here, the decimal number after the slash (/) is the number of bits used for the network prefix.

a) 254

b) 256

c) 510

d) 512

**Q34.** Which of the following is the broadcast address of the network with the address 192.168.128.0/26? Here, the decimal number after the slash (/) is the number of bits used for the network prefix.

a) 192.168.128.63

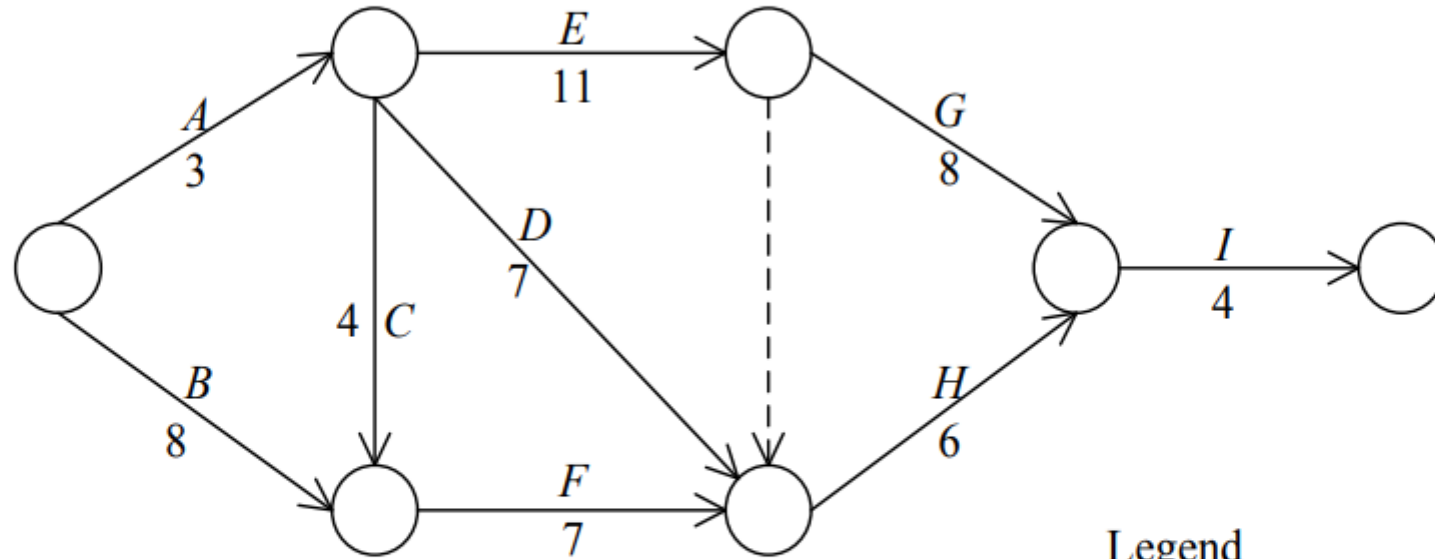
b) 192.168.128.127

c) 192.168.128.252

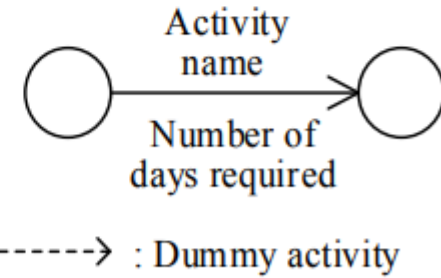
d) 192.168.128.255



**Q55.** The arrow diagram below shows a project's activities and milestones. Which of the following is the minimum project completion time in days?



Legend



a) 20

b) 24

c) 25

d) 26

**Q56.** IT services are provided under the conditions in the SLA shown below. What is the maximum number of hours of downtime in a month that can satisfy the SLA?

[Conditions in the SLA]

The number of business days per month is 30.

The service hours are from 7 AM to 11 PM on business days.

The agreed availability is 99% or more.

Maintenance time can be ignored.

a) 1.2

b) 3.0

c) 4.8

d) 7.2

**Q77.** Products *A*, *B*, *C*, and *D* are to be introduced to the market. The table below shows the expected profit for each product with three (3) sales forecasts (High, Medium, and Low) that are estimated to occur in accordance with the probability in the table. Which of the following is the product that is expected to make the highest profit according to the expected value principle?

Product	High		Medium		Low	
	Profit (\$)	Probability (%)	Profit (\$)	Probability (%)	Profit (\$)	Probability (%)
<i>A</i>	100,000	75	20,000	20	-40,000	5
<i>B</i>	130,000	60	30,000	30	-20,000	10
<i>C</i>	150,000	50	40,000	30	-20,000	20
<i>D</i>	100,000	70	10,000	20	-50,000	10

a) *A*

b) *B*

c) *C*

d) *D*

**Q78.** A company sells two products,  $A$  and  $B$ , and makes a profit of 40 dollars and 30 dollars per unit on them respectively. They are produced through a common production process and are sold in two different markets. The production process has a total capacity of 3,000 person-hours. Product  $A$ 's production time is 3 person-hours that is three times longer than that of product  $B$ . Having surveyed the market, company officials feel that the maximum number of units of product  $A$  that can be sold is 8,000, while for product  $B$  the maximum number of units is 1,200. Subject to these limitations, products can be sold in any combination. When the linear programming model is applied, which of the following is the formulation result that obtains the production amount that maximizes the company's total profit? Here, the number of units of products  $A$  and  $B$  are  $x$  and  $y$ , respectively.

a) Objective function  $40x+30y \rightarrow$  to be maximized

Constraints  $3x+9y \leq 3,000$

$x \geq 8,000$

$y \geq 1,200$

$x \geq 0, y \geq 0$

b) Objective function  $40x+30y \rightarrow$  to be maximized

Constraints  $3x+9y \leq 3,000$

$x \leq 8,000$

$y \leq 1,200$

$x \geq 0, y \geq 0$

c) Objective function  $40x+30y \rightarrow$  to be maximized

Constraints  $3x+y \leq 3,000$

$x \geq 8,000$

$y \geq 1,200$

$x \geq 0, y \geq 0$

d) Objective function  $40x+30y \rightarrow$  to be maximized

Constraints  $3x+y \leq 3,000$

$x \leq 8,000$

$y \leq 1,200$

$x \geq 0, y \geq 0$