

[Standard Answer] SW PMI Q1

SQ 1 The amount of data on each branch line is the sum total of amount of data on the branch line and data transferred from/to other branch lines. Therefore, (Answer)

The amount of data on LAN 1 =  $X_{11}+X_{12}+X_{13}+X_{21}+X_{31}$  = a:2.5 (Mbps)

The amount of data on LAN 2 =  $X_{21}+X_{22}+X_{23}+X_{12}+X_{32}$  = b:4.3 (Mbps)

The amount of data on LAN 3 =  $X_{31}+X_{32}+X_{33}+X_{13}+X_{23}$  = c:3.0 (Mbps)

Branch Line	To LAN 1	To LAN 2	To LAN 3
From LAN 1	$X_{11}$	$X_{12}$	$X_{13}$
From LAN 2	$X_{21}$	$X_{22}$	$X_{23}$
From LAN 3	$X_{31}$	$X_{32}$	$X_{33}$

SQ 2 This question simply asks about network topology.

If 2A communicates with LAN 1: 2A - 3A - 3B - 1B

If 2A communicates with LAN 3: 2A - 3A

If 2B communicates with LAN 1: 2B - 1B

If 2B communicates with LAN 3: 2B - 3B

(Answer) d: 4 e: 2 f: 2 g: 2

SQ 3

Regarding j,

The amount of data on LAN3 when 2B fails = The normal amount of data on LAN 3 + Data bypassing LAN 2

=  $3.0 + X_{12} + X_{21}$

=  $3.0 + 1.0 + 0.1$

= 4.1

The amount of data on LAN2 when 3B fails = The normal amount of data on LAN2 + Data bypassing LAN3

$$= 4.3 + X_{13} + X_{31}$$

$$= 4.3 + 0.6 + 0.5$$

$$= 5.4$$

Therefore, the amount of data on LAN2 rapidly increases when 3B fails.

(Answer) h: 2B i: 3B j: 2
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[Score Allocation] Total 13 points

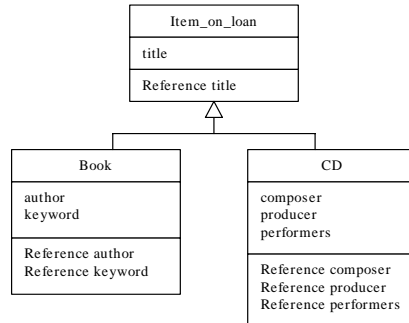
SQ 1 2 points x 3 = 6 points

SQ 2 1 point x 4 = 4 points

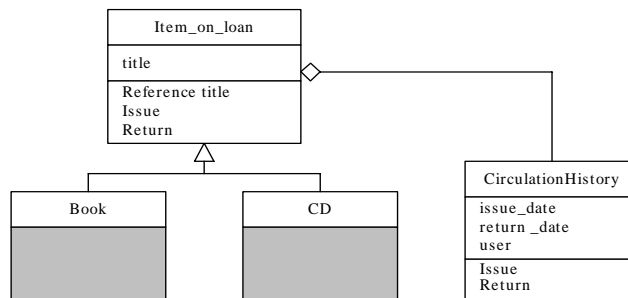
SQ 3 1 point x 3 = 3points

[Standard Answer] SW PMI Q2

SQ 1



SQ 2



Note: Do not write anything in the shaded areas.

SQ 3	a: capsule	b: operation Other answers such as "method" and "interface" are also correct.	c: data
	d: override	e: polymorphism	f: heap/system
	g: garbage collector		

[Score Allocation] Total 13 points

SQ 1 Total: 1 point x 3 = 3 points (Each class: 1 point)

SQ 2 Total: 3 points (Item\_on\_loan class: 1 point CirculationHistory class: 2 points)

SQ 3 Total: 1 point x 7 = 7 points (Each class: 1 point)

[Standard Answer] SW PMI Q3

SQ 1	a	Sender A's secret key		
	b	Sender A's public key		
SQ 2	c	hash function	d	common key
	e	common key	f	hash function
SQ 3	the time needed for encryption and decryption			
SQ 4	falsification (of message)			
SQ 5	e			

[Score Allocation] Total 13 points

SQ 1 2 points x 2 = 4 points

SQ 2 1 point x 4 = 4 points

SQ 3 2 points

SQ 4 2 points

SQ 5 1 point

The most important characteristic expected of hash function is that the original message cannot be restored from the message digest.

[Standard Answer] SW PMI Q4

SQ 1 Assume that the proportion of memory allocated to the main memory necessary for OS is  $X_{os}$ , application program is  $X_t$ , and program for receiving data from the securities exchanges is  $X_{in}$ . Also, assume that memory used by receiving tasks are  $M_a$  and  $M_b$ , the Application Tasks 1 through 3 are  $M_1$ ,  $M_2$ , and  $M_3$ , the OS is  $M_{os}$ , and the numbers of executed tasks among Applications 1 through 3 at the peak time are  $N_1$ ,  $N_2$ , and  $N_3$ . Required size of the main memory  $M_x$  is:

$$\begin{aligned} M_x &= (M_a + M_b) X_{in} + (M_1 N_1 + M_2 N_2 + M_3 N_3) X_t + M_{os} X_{os} \\ &= (5+5) \times 0.8 + (6 \times 50 + 6 \times 30 + 10 \times 20) \times 0.5 + 60 \times 0.8 \\ &= 396 \end{aligned}$$

**Answer 396 (Mbytes)**

SQ 2 CPU processing time  $T$  (ms) at peak time is sum amount of time for each task to operate and use CPU. However, each task may be processed in 10 seconds, the total processing time is calculated by the following formula.

$$\begin{aligned} T &= (T_a + T_b) / 10 + (T_1 * N_1 + T_2 * N_2) / 10 \\ &= (200+200) / 10 + (300*50+200*30) / 10 = 2140 \end{aligned}$$

It takes 2.14 seconds to process the tasks. To process them in 1 second, there must be at least 3 CPUs.

**Answer 3**

SQ 3 (1) The amount of communication is the amount of data of Applications 1 through 3. If TCP is used, it has to connect to each PC and the amount of communication will be huge.

The amount of communication for Application 1 on each PC

$$= 2000 \text{ (records)} * 64 \text{ (bytes)} * 8 \text{ (bit/byte)} / 10 \text{ seconds} = 102400 \text{ (bit/sec)}$$

The amount of communication for Application 2 on each PC

$$= 1000 \text{ (records)} * 64 \text{ (bytes)} * 8 \text{ (bit/byte)} / 10 \text{ seconds} = 51200 \text{ (bit/sec)}$$

The amount of communication for Application 3 on each PC

$$= 3600 * 8 \text{ (bit/byte)} / 30 \text{ seconds} = 960 \text{ (bit/sec)}$$

If TCP/IP is used, it depends on the number of PCs it communicates with

The total amount of data on TCP/IP = The amount of communication for Application 1 on each PC \* the number of PCs which select Application 1 + the amount of communication for Application 2 on each PC \* the number of PCs which select Application 2 + the amount of communication for Application 3 on each PC \* the number of PCs which select Application 3

$$= 102400 * 50 + 51200 * 30 + 960 * 20$$

$$= 6675200$$

Answer 6.7 Mbit/sec

(2) The characteristic of UDP is fixed length and it can use broadcast address to send to multiple addresses at one time.

However, reliability of UDP is lower than TCP, since it does not check if the data has been delivered. Also there is no responding packet.

Answer a, b

[Score Allocation] Total 13 points

SQ 1 3 points

SQ 2 4 points

SQ 3    2 points x 3 = 6 points

[Standard Answer] SW PMI Q5

SQ 1

- a:  $k = 1$
- b: `push(pos)`
- c: `push(line)`
- d:  $k = 2$
- e: `not empty()`

SQ 2

- (A) Left parenthesis is missing.
- (B) Right parenthesis is missing.

SQ 3

- f: (b)  $k \% 2 = 1$     Other answers:  $(k=1)$  or  $(k=3)$  or  $(k=5)$
- g: (g) `not empty()`
- h: (d) `peek() = k-1`

[Score Allocation]    Total 24 points

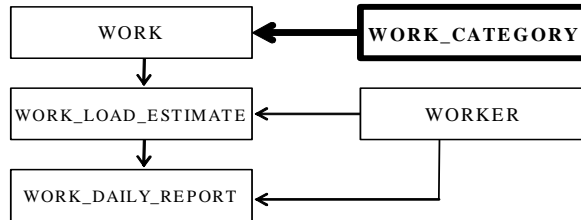
SQ 1    2 points x 5 = 10 points

SQ 2    5 points    (Both (A) and (B) should be correct.)

SQ 3    (1 point+2 points)×3 = 9 points    (Alphabet: 1 point and Formula: 2 points)

[Standard Answer] SW PMI Q6

SQ 1 (1)



- (2) a: WORK\_CATEGORY\_CODE    b: WORK\_CATEGORY\_CODE  
 c: WORK\_CATEGORY\_NAME

SQ 2 d: CREATE VIEW

e: AS SELECT

f: SUM (WORK\_HOURS)    SUM(B. WORK\_HOURS) is also correct.

g: WHERE D. WORK\_CATEGORY\_CODE = 1  
 AND A.WORKER\_CODE = B.WORKER\_CODE  
 AND D.WORK\_CODE = B.WORK\_CODE  
 AND A.WORKER\_CODE = C.WORKER\_CODE  
 AND D.WORK\_CODE = C.WORK\_CODE

h: D.WORK\_CODE, A.WORKER\_CODE

SQ 3 i: SELECT

j: FROM WORK\_ACTUAL\_TBL

k: ORDER BY

l: ASC

SQ 4 m: view table    n: implementation    o: function

[Score Allocation] Total 24 points

SQ 1 (1) 4 points (Relation (arrow): 2 points, Entity (boxes): 2 points)

(2) 1 point x 3 = 3 points

(Even if the item name is correct, score will not be given when the underline representing key item is wrong.)

SQ 2 7 points (1 point each, with the exception of 3 points for g)

SQ 3 1 points x 4 = 4 points

SQ 4 2 points x 3 = 6 points

[Standard Answer] SW PMII Q1

SQ 1 a: District\_code, b: Registered\_rooms

SQ 2 c: RESERVATION, d: Member\_no, e: Member, f: referential constraint (or  
Referential integrity constraint,

REFERENCES, FOREIGN KEY)

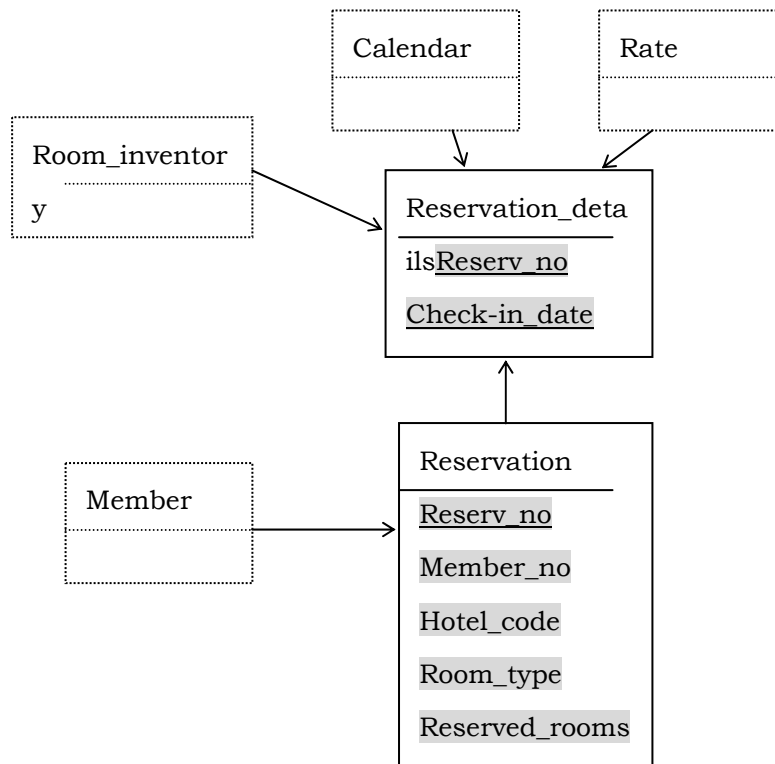
SQ 3 g: RESERVATION.RESERVED\_ROOMS \* RATE.ROOM\_CHARGE,

h: MEMBER.MEMBER\_NO = RESERVATION.MEMBER\_NO,

i: RATE.SEASON = CALENDAR.SEASON

(Answers for h and i can be in arbitrary order)

SQ 4



SQ 5 (1) j: f (INSERT into the Reservation), k: d (OPEN the  
cursor),

(Answers for j and k can be in arbitrary order)

l: c (FETCH with the cursor), m: b (ROLLBACK),

n:  (INSERT into the Reservation\_details)

(2) o:

p:

or

[Score]  Total 100 points

SQ 1 10 points x 2 = 20 points

SQ 2 4 points x 4 = 16 points

SQ 3 6 points x 3 = 18points

SQ 4 2 points x 7 = 14 points

SQ 5 (1) 4 points x 5 = 20 points

(2) 6 points x 2 = 12 points