Nitish Kumar Gupta
Course: GATE
Computer Science Engineering(CS)

HOME
MY TEST
BOOKMARKS
MY PROFILE
REPORTS
BUY PACKAGE
ASK AN EXPERT
OFFER
EXCLUSIVE OFFER FOR OTS STUDENTS ONLY ON BOOK PACKAGES

# MULTIPLE SUBJECT : COMPUTER NETWORKS + DATABASES (GATE - 2019) - REPORTS

OVERALL ANALYSIS | COMPARISON REPORT | SOLUTION REPORT

ALL(33) | CORRECT(0) | INCORRECT(0) | SKIPPED(33)

**Q. 1**

For k number of users, how many keys are needed using private key cryptography and public key cryptography schemes respectively?

Solution Video | Have any Doubt ?

A $2k, 2k$

B $2k, \frac{k^2-k}{2}$

C $\frac{k^2-k}{2}, 2k$ Correct Option

**Solution :**
(c)

In symmetric $\Rightarrow {}^kC_2 = \frac{k(k-1)}{2}$

Asymmetric $\Rightarrow 2k$
Explanation for asymmetric:
Every user has a (public key, private key) pair.
1 user $\Rightarrow$ 2 keys
$k$ users $\Rightarrow 2k$ keys
Hence option (c) is the right answer.

D $\frac{k^2-k}{2}, \frac{k^2-k}{2}$

QUESTION ANALYTICS +

---

**Q. 2**

Consider the relation and functional dependencies given below:
R(SSN, Name, Phonetype, Phonenumber)
F = {SSN → Name
SSN, Phonetype → Phonenumber
SSN, Phonetype → Name
Phonenumber → SSN, Name, Phonetype}
What is the canonical cover of F?

Solution Video | Have any Doubt ?

A SSN → Name SSN, Phonetype → Phonenumber Phonenumber → SSN, Name

B SSN → Name SSN, Phonetype → Phonenumber SSN, Phonetype → Name Phonenumber → SSN, Phonetype

C SSN → Name SSN, Phonetype → Phonenumber Phonenumber → SSN, Phonetype Correct Option

**Solution :**
(c)
Make functional dependencies such that RHS contain single attributes.
SSN → Name ...(1)
SSN, Phonetype → Phonenumber ...(2)
SSN, Phonetype → Name ...(3)
Phonenumber → SSN ...(4)
Phonenumber → Phonetype ...(5)
Phonenumber → Name ...(6)
Closure of $(SSN, Phonetype)^+$ = Phonenumber, Name, SSN
We get the Name attribute without FD ...(3) so it is redundent.
$(Phonenumber)^+$ = SSN, Phonetype, Name
FD ...(6) is redundent.
Canonical cover is
SSN → Name
SSN, Phonetype → Phonenumber
Phonenumber → SSN,Phonetype
Correct option is(c).

D SSN → Name SSN, Phonetype → Phonenumber Phonenumber → Name, Phonetype

QUESTION ANALYTICS +

---

**Q. 3**

Which of the following pairs of N/W can be combined to form supernet?

Solution Video | Have any Doubt ?

A 178.29.3.0
178.29.4.0
178.28.5.0
178.28.6.0

B 212.212.14.0
212.212.15.0
212.212.16.0
213.212.17.0

C 194.212.4.0
194.212.5.0
194.212.6.0
194.212.7.0

Correct Option

**Solution :**
(c)
Groups of networks can be combined into a single supernet only if networks are continuous.

D 194.212.8.0
195.213.8.0
196.214.10.0
197.215.11.0

QUESTION ANALYTICS +

---

**Q. 4**

Consider the following statements given below:

$S_1$ : A relationship in an E-R diagram always translate to a table in the relational model.

$S_2$ : The full outer join operation, can be written as $(r \bowtie s) \cup (r - \Pi_R (r \bowtie s)) \times \{(\text{null}, \ldots\ldots \text{null})\}$ where $r(R)$ and $s(S)$ are relation where the constant relation {(null, ..... null)} is on the schema S-R.

$S_3$ : A theta join is a natural join followed by selection operation.

Which of the following statements are true?

Solution Video | Have any Doubt ?

A $S_1$ and $S_2$ only

B $S_2$ and $S_3$ only

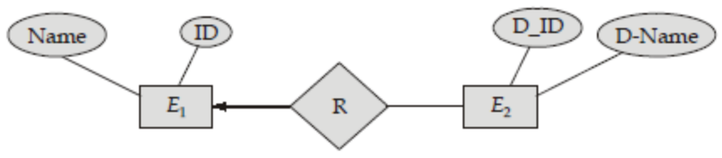
C $S_1$ and $S_3$ only

D None of the above

Correct Option

**Solution :**
(d)

$S_1$ : A relationship in an E-R diagram not always translate to a table in the relational model.
In 1 : 1 and many to one, relationship is not translate to a table.




It contain 2 table $E_1$R (ID, Name, D_ID) and $E_2$ (D_ID, D-Name)
So $S_1$ is false.

$S_2$ : Left outer join operation $r \bowtie s$, can be written as:
$(r \bowtie s) \cup (r - \pi_R (r \bowtie s)) \times \{(\text{null}, \ldots\ldots \text{null})\}$ where the constant relation {(null, ..... null)} is on the schema S-R.
So $S_2$ is false.

$S_3$ : Theta join is a cartesian product followed by selection operation.
So $S_3$ is false.

QUESTION ANALYTICS +

---

**Q. 5**

Which of the following scenario specifies the correct reply for connection request in TCP environment? Assume that server accepts the request and wants to communicate. Answer in terms of the order of (SYN, ACK) pair.

Solution Video | Have any Doubt ?

A (0, 0)

B (0, 1)

C (1, 0)

D (1, 1)

Correct Option

**Solution :**
(d)
Connection request should be (1, 0) and reply would be (1, 1).

QUESTION ANALYTICS +

---

**Q. 6**

Consider the following relation and tuple relational calculus query given below:
Employee (eid, ename, salary)

$$\{E_1 . \text{eid} \mid E_1 \in \text{Employee} \wedge \exists E_2 \in \text{Employee} \; (E_2 . \text{salary} > E_1 . \text{salary} \wedge \neg(\exists E_3 \in \text{Employee} \; (E_3 . \text{salary} > E_2 . \text{salary})))\}$$

What does the query return?

Solution Video | Have any Doubt ?

A Find the eids of employee who make the highest salary.

B Find the eids of employee who make second highest salary. Correct Option

**Solution :**
(b)
This query return the eids of employee who make the second highest salary.

C Find the eids of employee who make third highest salary.

D Find the eids of employee who does not make highest salary.

QUESTION ANALYTICS +

---

**Q. 7**

The minimum hamming distance to CORRECT and DETECT K-bit of errors are respectively.

Solution Video | Have any Doubt ?

A K + 1, K

B 2K, K

C 2K + 1, K

D None of these Correct Option

**Solution :**
(d)
• To correct K-bit of errors hamming distance should be 2K + 1.
• to detect K-bit of errors hamming distance should be K + 1.
Hence option (d) is the correct answer.

QUESTION ANALYTICS +

---

**Q. 8**

For what values of $x$ and $y$, including NULL, does the Boolean expression $x \leq 3$ AND NOT $(y \geq 1)$ have the truth value UNKNOWN in SQL?

Solution Video | Have any Doubt ?

A $x$ is NULL and $y$ is either NULL or $y < 1$

B $y$ is NULL and $x$ is either NULL are $x \leq 3$

C Both (a) and (b) Correct Option

**Solution :**
(c)
The AND evaluates to UNKNOWN when atleast one of the $(x \leq 3)$, NOT $(y \geq 1)$ is UNKNOWN and none is false.
(a) $x \leq 3$ AND NOT $y \geq 1$, for $x$ = NULL $(x \leq 3)$ is UNKNOWN for $y < 1$, NOT $(y \geq 1)$ is TRUE and for $y$ = NULL result is UNKNOWN so AND evaluates UNKNOWN.
(b) for $y$ = NULL and $x$ is either NULL or $x \leq 3$ result of Boolean expression is UNKNOWN.
Both (a) and (b) is correct.

D None of the above

QUESTION ANALYTICS +

---

**Q. 9**

A computer on a 6 Mbps network is regulated by a token bucket. The token bucket is filled at a rate of 1 Mbps. It is initially filled to capacity with 8 megabits. How long can the computer transmit at the full 6 Mbps _____ in (sec).

Solution Video | Have any Doubt ?

1.6 (1.50 - 1.70) Correct Option

**Solution :**
1.6 (1.50 - 1.70)

$$S = \frac{C}{(M-P)}$$

where,
C = Bucket capacity
M = Output rate
P = Bucket fill rate

$$S = \frac{8}{6-1} = 1.6 \text{ sec}$$

Answer is 1.6.

QUESTION ANALYTICS +

---

**Q. 10**

Consider the following statements given below:
$S_1$ : A relation $R(A_1, A_2 \ldots A_n)$ can always be decomposed into BCNF.
$S_2$ : While an entity in an ER diagram translate to a relation in a relational model, a relationship will translate to a join between relations.
$S_3$ : For range queries every B+ tree index requires less I/O than a full table scan.
$S_4$ : A relation R(A, B, C, D) with functional depenencies $\{A \rightarrow B, AB \rightarrow C\}$ is in BCNF.
How many number of statements are false _____.

Solution Video | Have any Doubt ?

3 Correct Option

**Solution :**
3

$S_1$ : **True:** It can always accomposed into table with two attributes, which are always in BCNF.
$S_2$ : **False:** A relationship translate to a relation.
$S_3$ : **False:** It is not true if the range includes the entire table.
$S_4$ : **False:** R(A, B, C, D)
$A \rightarrow B$, $AB \rightarrow C$
It is not in BCNF A and$AB$ is not a superkey because its closure does not contain attribute D.

QUESTION ANALYTICS +

---

**Q. 11**

Consider a new version of TCP header called TCP++. The header of TCP++ accommodates a round trip time of 200 ms, with bandwidth of 10 Mbps. The number of bits required for the advertised window (in bits) are _____.

Solution Video | Have any Doubt ?

18 Correct Option

**Solution :**
18

In order to keep the pipe full, the window should remain open for complete RTT.

Bandwidth = 10 Mbps
RTT = 200 ms
Window size = 200 ms × 10 Mbps = 2 Mbps
= 0.25 MB/sec
Number of bits for advertised window
= $\log_2$ (0.25 M)
= 18 bits

QUESTION ANALYTICS +

---

**Q. 12**

Consider the following relations given below:

R

| A | B |
|---|---|
| 1 | 1 |
| 2 | 1 |
| 3 | 3 |

S

| C | D |
|---|---|
| 1 | 2 |
| 3 | 4 |
| 3 | 5 |

$\Pi_{AD}(R \times S) - \rho_{A \leftarrow B}(\Pi_{BD}(R_{\triangleright\triangleleft_{B=C}} S))$

Number of tuples return by the above query when it is executed on the above instances of relation R and S is _____.

Solution Video | Have any Doubt ?

6 Correct Option

**Solution :**
6

$\Pi_{AD}(R \times S)$

$R \times S$ =

| A | B | C | D |
|---|---|---|---|
| 1 | 1 | 1 | 2 |
| 1 | 1 | 3 | 4 |
| 1 | 1 | 3 | 5 |
| 2 | 1 | 1 | 2 |
| 2 | 1 | 3 | 4 |
| 2 | 1 | 3 | 5 |
| 3 | 3 | 1 | 2 |
| 3 | 3 | 3 | 4 |
| 3 | 3 | 3 | 5 |

$\Pi_{AD}$ =

| A | D |
|---|---|
| 1 | 2 |
| 1 | 4 |
| 1 | 5 |
| 2 | 2 |
| 2 | 4 |
| 2 | 5 |
| 3 | 2 |
| 3 | 4 |
| 3 | 5 |

$\Pi_{AD}(R \times S) - \rho_{A \leftarrow B}(\Pi_{BD}(R_{\triangleright\triangleleft_{B=C}} S))$

| A | D |
|---|---|
| 1 | 4 |
| 1 | 5 |
| 2 | 2 |
| 2 | 4 |
| 2 | 5 |
| 3 | 2 |

So number of tuples return 6.

QUESTION ANALYTICS +

---

**Q. 13**

The maximum length of the cable (in km) for transmitting data at a rate of 100 Mbps in ethernet LAN with frame size of 1000 bits (take signal speed as $2 \times 10^6$ km/sec) is _____.

Solution Video | Have any Doubt ?

1 Correct Option

**Solution :**

1

$$\text{Transmission Time} = 2 \times \text{Propagation delay}$$

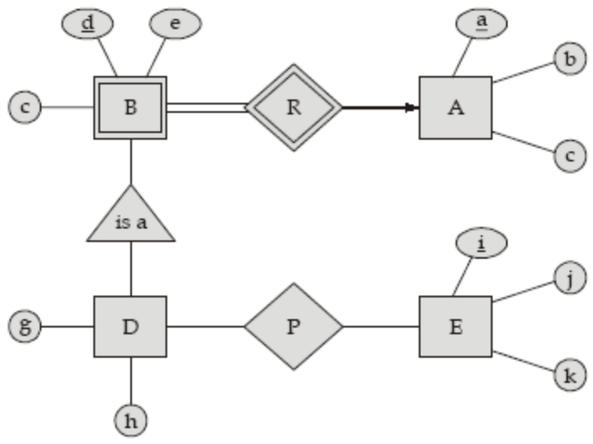
$$\frac{1000}{100\times10^6} = \frac{2\times L}{L\times10^5\times10^3}$$

Solve to get, $L = 1\text{ km}$

QUESTION ANALYTICS

**Q. 14**

Consider the following E-R digaram:




If the above E-R diagram is converted into RDBMS what is the sum of all attributes in all relations _____.

Solution Video | Have any Doubt ?

17 Correct Option

**Solution :**
17

Entity B is weak entity and dependent on A, hence the key of B needs to include the key of A. D includes the key of B.
A(a, b, c) – 3 attributes
B(d, a c, e) – 4 attributes
D(d, a g, h) – 4 attributes
E(i, j, k) – 3 attributes
P(d, a, i) – 3 attributes
Total 17 attributes.

QUESTION ANALYTICS

**Q. 15**

The value of HLEN of IP packet is 1000 in binary. The number of bytes of operations field are included in this packet are _____.

Solution Video | Have any Doubt ?

12 Correct Option

**Solution :**
12

$$\begin{aligned} \text{HLEN} &= (1000)_2 \\ &= (8)_{10}\text{ rows} \\ &= 8 \times 4 = 32\text{ bytes} \\ \text{Total header size} &= 20\text{ bytes} + \text{options} \\ 32\text{ bytes} &= 20\text{ bytes} + x \\ x &= 12\text{ bytes} \end{aligned}$$

So, 12 bytes of options field are carried by this header.

QUESTION ANALYTICS

**Q. 16**

Consider a $B^+$ tree index with $n = 50$, where n is the maximum number of key a block can have.Let the $B^+$ tree index be dense over 100000 records. What is the number of nodes in the tree that e have to examine when searching for a record _____. (Order of internal and leaf node is same)

Solution Video | Have any Doubt ?

3 Correct Option

**Solution :**
3

A block can have 50 key in the $B^+$ tree leaves node contain records so $\frac{100000}{50} = 2000$ leaves in the tree and $\frac{2000}{51}$ interior node and one root node so there are 3 level in the tree, we have to examine 3 node for searching a record.
Answer is 3.

QUESTION ANALYTICS

**Q. 17**

Consider the following statement given below
$S_1$ : In 1-persistent CSMA (Carrier Sense Multiple Access), a station senses the channel when it want to send a frame. If channel is idle then it send the frame otherwise it does not continually senses and wait for a random amount of time and repeats the same process.
$S_2$ : Trace route always gives the right path from source to destination.
$S_3$ : Link state is a inter domain protocol.
Which of the following statements is/are true?:

Solution Video | Have any Doubt ?

A $S_1$ and $S_2$ only

B $S_1$ and $S_3$ only

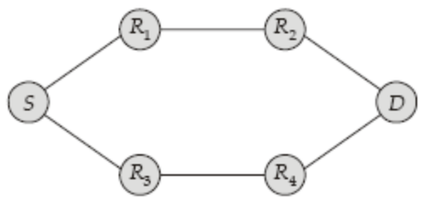
C $S_2$ and $S_3$ only

D None of the above — Correct Option

**Solution :**
(d)

$S_1$ : In 1-persistent CSMA, a sender continually sense the channel if it is busy, it continually sense the channel without any random waiting time. $S_1$ is false

$S_2$ : It does not always give the right path.




It may give $S\ R_1, R_3, R_4\ D$.

$S_3$ : Link state is intra domain or interior protocol not a inter domain protocol. $S_3$ is false

So option (d) is correct.

QUESTION ANALYTICS

---

**Q. 18**

Consider the following schedules involving three transaction

$S_1 : W_2(x), W_1(x), R_3(x), R_1(x), W_2(y), R_3(y), R_3(z), R_2(x)$

$S_2 : R_3(z), R_3(y), W_2(y), R_3(z), W_1(x), R_3(x), W_2(x), R_1(x)$

$S_3 : R_3(z), W_2(x), W_2(y), R_1(x), R_3(x), R_2(z), R_3(y), W_2(z), W_1(x)$

$S_4 : R_2(z), W_2(x), W_2(y), W_1(x), R_1(x), R_3(x), R_3(z), R_3(y), W_1(x)$

Which of the following schedules are conflict serializable?

Solution Video | Have any Doubt ?

A $S_1$ and $S_3$ only

B $S_3$ and $S_4$ only

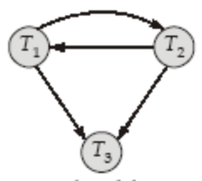
C $S_2$ only

D None of the above — Correct Option

**Solution :**
(d)

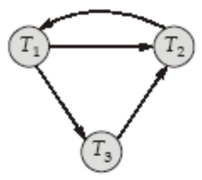
A schedule is conflict serializable if the precedence graph does not contain any cycle.

Precedence graph of $S_1$:



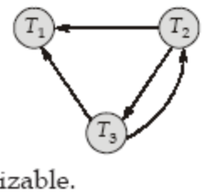

It contain cycle $T_1T_2T_1$ so not conflict serializable.

Precedence graph of $S_2$:



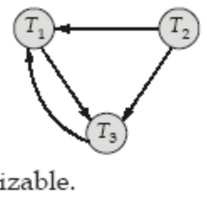

It contain cycle so not conflict serializable.

Precedence graph of $S_3$:




It contain cycle so not conflict serializable.

Precedence graph of $S_4$:




It contain cycle so not conflict serializable.

So correct option is (d).

QUESTION ANALYTICS

---

**Q. 19**

A router has the following (CIDR) entries in its routing table:

| IP/mask | Interface |
|---|---|
| 135.46.56.0/22 | Interface 0 |
| 135.46.60.0/22 | Interface 1 |
| 192.53.40.0/23 | Router 1 |
| default | Router 2 |

A packet having a destination address 135.46.52.2 arrives at the router. On which interface will it be forwarded?

Solution Video | Have any Doubt ?

A Interface 0

B Interface 1

C Router 1

D Router 2 Correct Option

**Solution :**
(d)

For Interface 0

| | |
|---|---|
| Subnet mask | 11111111.11111111.11111100.00000000 |
| | 10000111.00101110.00111000.00000000 |
| Network Id | 10000111.00101110.00111000.00000000 |

For IP address 135.46.52.2 Network ID is 135.46.52.0
Network ID not match so router does not forwarded to interface 0.
Similarly doing for Interface 1 and Router 1 Network ID does not match so it forwarded to default which is router 2.
Hence option (d) is correct.

QUESTION ANALYTICS +

**Q. 20**

Consider the following relation:
Emp (eno, ename, title, city)
Project (pno, pname, budget, city)
Works (eno, pno, duration)

**Query 1:** SELECT pname FROM Project WHERE
NOT (budget < = SOME (SELECT budget
FROM Project WHERE city = 'Delhi'))

**Query 2:** SELECT pname FROM Project $P_1$ WHERE
NOT EXISTS (SELECT budget FROM Project
$P_2$ WHERE city = 'Delhi' AND $P_1$.budget <= $P_2$.budget)

Which of the following above query is the correct implementation of "Find the names of projects whose budget are greater than the projects of all project located in Delhi"?

Solution Video | Have any Doubt ?

A Only query 1

B Only query 2

C Both query 1 and query 2 Correct Option

**Solution :**
(c)

**Query 1:** One way to think this query is "Find the name of projects such that there is no project located in Delhi that has a budget greater than that projects.

Ex:

| Pno | Pname | Budget | City |
|---|---|---|---|
| 1 | $P_1$ | 10000 | Delhi |
| 2 | $P_2$ | 50000 | Delhi |
| 3 | $P_3$ | 80000 | Mumbai |
| 4 | $P_4$ | 90000 | Pune |
| 5 | $P_5$ | 20000 | Mumbai |

Inner query give result (10000, 50000) because of NOT before the WHERE clause Query 1 give name of project whose budget are greater than all project in Delhi.
**Query 2:** Corelated sub query finds budgets of projects located in Delhi and if that project has a larger budget than what is found in the outer query, than it return pname NOT EXISTS says that we want this corelated sub query to return an empty result, in this case the projects return in the outer query have budgets greater than all projects located in Delhi.
Query 2 is also correct implementation.
So option (c) is correct.

D None of the above

QUESTION ANALYTICS +

**Q. 21**

Match List-I with List-II and select the correct answer using the codes given below:
List-I
A. Stop and wait ARQ
B. Go-back-N ARQ
C. Selective repeat ARQ
List-II
1. Each frame send or resend needs a timer, which means the timer needs to be numbered.
2. Acknowledgment send when data are delivered to network layer.
3. Only 2 sequence number is used and the window size is 1.
4. No action is performed by the receiver until the desired frame is obtained.
Codes:

| | A | B | C |
|---|---|---|---|
| (a) | 3 | 2 | 1 |
| (b) | 3 | 4 | 1 |
| (c) | 2 | 1 | 4 |
| (d) | 2 | 4 | 1 |

Solution Video | Have any Doubt ?

A a

B b Correct Option

**Solution :**
(b)

C c

D d

QUESTION ANALYTICS

**Q. 22**

Consider the following schema:
Producer (pid, pname)
Part (id, name, color)
Category (pid, id)
"Find the pids of producer who produces every black and white part".
Which of the following given options is a correct implementation of the above statement?

Solution Video | Have any Doubt ?

A $(\Pi_{pid,\ id}\ Category)/(\Pi_{id}\ (\sigma_{color\ =\ 'white'\ \wedge\ color\ =\ 'black'})\ (Part))$

B $\{T \mid \exists T_1 \in Category\ (\forall X \in Part\ (X.color \neq white \vee X.color \neq 'black') \wedge \exists T_2 \in Category\ (T_2.id = X.id \wedge T_2.pid = T_1.pid) \wedge T.pid = T_1.pid)\}$

C Correct Option

```
SELECT C.pid FROM Category C WHERE
NOT EXISTS (SELECT P.id FROM Part P
    WHERE (P.color = 'white' OR P.color = 'black')
AND (NOT EXISTS (SELECT C1.pid FROM
    Category C1 WHERE C1.pid = C.pid AND
                      C1.pid = P.id)))
```

**Solution :**
(c)
Part color can be white and black but can not both at same time hence relational algebra query is not correct because its find pid for those who have both white and black color at same time.
TRC query is also not a correct implementation.
SQL query is the correct implementation of the given statement.
Hence option (c) is correct.

D None of the above

QUESTION ANALYTICS

**Q. 23**

Assume a slow start mechanism is used and assume there is no congestion. The round trip time is 10 ms and the maximum segment size is 24 KB. How much time is required to reach 24 KB of window size with packet size of 2 KB?

Solution Video | Have any Doubt ?

A 50 ms

B 30 ms

C 120 ms

D 40 ms Correct Option

**Solution :**
(d)

$1^{st}$ RTT $\rightarrow$ 2 KB
$2^{nd}$ RTT $\rightarrow$ 4 KB
$3^{rd}$ RTT $\rightarrow$ 8 KB
$4^{th}$ RTT $\rightarrow$ 16 KB
$5^{th}$ RTT $\rightarrow$ 24 KB

So, after $4^{th}$ RTT we can send 24 KB of data.
So, 4 × 10 ms = 40 ms time is required to reach 24 KB of window size.

QUESTION ANALYTICS

**Q. 24**

Consider the following schema and relation given below:
Student (snum, sname, age)
Enroll (snum, cname)
Class (cname, fid, room)

**Student**

| snum | sname | age |
|---|---|---|
| 10 | Arun | 18 |
| 20 | Shyam | 20 |
| 30 | Ram | 19 |
| 40 | Suresh | 21 |
| 50 | Andy | 20 |
| 60 | Gita | 18 |
| 70 | Anubhav | 19 |

**Enroll**

| snum | cname |
|---|---|
| 10 | Databases |
| 10 | Operating System |
| 20 | Computer Network |
| 30 | Theory of Compuation |
| 30 | Databases |
| 40 | Math |
| 40 | Physics |
| 10 | Computer Network |
| 30 | Maths |
| 50 | Databases |
| 60 | Operating System |
| 50 | Computer Network |

```
SELECT DISTINCT S.sname FROM students S
    WHERE S.snum IN (SELECT E.snum FROM
        Enroll E GROUP BY E.snum
```

HAVING COUNT (*) >= ALL (SELECT COUNT (*)
FROM Enroll $E_2$ GROUP
BY ($E_2$.snum))

If the above SQL query executed on given relations Student, Enroll number of tuples return?

Solution Video | Have any Doubt ?

A 2 — Correct Option

**Solution :**
(a)
The SQL query find the names of students who enrolled in the maximum number of classes. The following relation is return by this query

| Arun |
|---|
| Ram |

Number of tuples return is 2.
Hence option (a) is correct.

B 4

C 3

D 1

QUESTION ANALYTICS

---

**Q. 25**

Consider a 90 Kbps link. Let X and Y be the respective maximum bandwidth (in Kbps) when pure Aloha and slotted Aloha is used. Then the value of $\left(\frac{X}{Y}\right)$ will be _____. (Upto 1 decimal place)

Solution Video | Have any Doubt ?

0.5 (0.4 - 0.6) — Correct Option

**Solution :**
0.5 (0.4 - 0.6)
**Finding X:**
For pure Aloha, max throughput is 18.4%.

$$\Rightarrow \quad X = \frac{18.4}{100} \times 90$$

For slotted Aloha, max throughput is 36.8%.

$$\Rightarrow \quad Y = \frac{36.8}{100} \times 90$$

Then $$\frac{X}{Y} = \frac{\left(\frac{18.4 \times 90}{100}\right)}{\frac{36.8 \times 90}{100}} = \frac{18.4}{36.8} = \frac{1}{2} = 0.5$$

QUESTION ANALYTICS

---

**Q. 26**

Consider the following relation given below:
R(CDEFGH)
Set of functional dependencies F = {CD → E, DE → C, CE → D, D → F, E → G}
It relation R is decomposed into lossless join, dependency preserving BCNF then the minimum number of relation required in this decomposition is _____.

Solution Video | Have any Doubt ?

4 — Correct Option

**Solution :**
4
R(CDEFGH)

$$F = \{CD \rightarrow E, DE \rightarrow C, CE \rightarrow D, D \rightarrow F, E \rightarrow G\}$$

$$CDH^+ = CDEFGH$$
$$DEH^+ = DEHCFG$$
$$CEH^+ = CEHDFG$$

Candidate key of relation R = {CDH, DEH, CEH} functional dependencies F is not satisfying BCNF property so we have to decompose relation R.

(1) $CD^+ = CDEFG$
$DE^+ = CDEFG$
$CE^+ = CDEFG$
$R_1$(CDE) is a table which satisfy functional dependencies CD → E, DE → C, CE → D.

(2) D → F is not satisfying BCNF property
$D^+ = DF$
make it a seperate relation $R_2$(DF)

(3) E → G
$E^+ = EG$, $R_3$(EG)

Three relation $R_1$(CDE), $R_2$(DF), $R_3$(EG) but it is not lossless to make it lossless join add one relation $R_4$(CDH).
So total 4 relation are required.
Answer is 4.

QUESTION ANALYTICS

---

**Q. 27**

For a 1 Gbps network operating over 4000 km, the delay is the limiting factor, not the bandwidth. Consider a MAN with the average source and

destination 20 km apart. At what data rate does the round trip delay due to the speed of light equal to the transmission delay for a 1 KB packet (in Mbps) _____. (Speed of light is 200 km/millisecond) (Upto 2 decimal places)

Solution Video | Have any Doubt ?

40.96 (40.95 - 10.97) — Correct Option

**Solution :**
40.96 (40.95 - 10.97)

For a 20 km line propagation delay is

$$= \frac{20\text{ km}}{200\text{ km/millisecond}} = 100\ \mu\text{sec}$$

Round trip time = 200 μsec

If the time to send 8192 bits and get the acknowledgment is 200 μsec the transmission and propagation delays are equal.

If B is the bit time then

$$8192 \times B = 2 \times 10^{-4}\text{ sec, the data rate is } \frac{1}{B}$$

Data rate = 40.96 Mbps

Answer is 40.96

QUESTION ANALYTICS

---

**Q. 28**

Consider the instance of a relation sailors is given below:

| id | name | rating | age |
|---|---|---|---|
| 2 | Arun | 7 | 45.0 |
| 8 | Andy | 1 | 33.0 |
| 13 | Bob | 8 | 55.5 |
| 18 | Ramesh | 8 | 25.5 |
| 27 | Ravi | 10 | 35.0 |
| 35 | Ram | 7 | 35.0 |
| 39 | Dustin | 10 | 16.0 |
| 49 | Ram | 9 | 35.0 |
| 70 | Rusty | 3 | 25.0 |
| 78 | Shri | 3 | 63.4 |

```
Select S.rating, AVG (S.age) AS average FROM
Sailor S GROUP BY S.rating HAVING 1
    < (SELECT COUNT (*) FROM
    Sailors S2 WHERE S.rating = S2. rating)
```

Number of tuples return when the SQL query is executed on the given instance of the relation _____.

Solution Video | Have any Doubt ?

4 — Correct Option

**Solution :**
4

SQL query return following table:

| rating | average |
|---|---|
| 3 | 44.5 |
| 7 | 40.0 |
| 8 | 40.5 |
| 10 | 25.5 |

Total 4 tuple is returned.

QUESTION ANALYTICS

---

**Q. 29**

An IP router with a Maximum Transfer Unit (MTU) of 1400 bytes excluding header length has received an IP data gram of size 4000 bytes excluding IP header length. The value of offset field in the header of the third IP fragment generated by the router for this packet are _____.

Solution Video | Have any Doubt ?

350 — Correct Option

**Solution :**
350

Data size = 4000 bytes

$$\text{Number of fragments} = \left\lceil \frac{4000}{1400} \right\rceil = 3$$

Each fragment contains 1400 bytes of data.
I[st] fragment [0 – 1399], offset = 000
II[nd] fragment [1400 – 2799], offset = 175
III[rd] fragment [2800 – 3999], offset = 350

QUESTION ANALYTICS

---

**Q. 30**

A relation $R(A_1, A_2, A_3 \ldots\ldots A_n)$, maximum number of candidate key possible when $n = 12$ is X assume the relation $S(B_1, B_2, B \ldots\ldots B_n)$ the maximum number of superkey possible when $n = 8$ is Y then value of X + Y is _____.

Solution Video | Have any Doubt ?

1179 — Correct Option

**Solution :**
1179

$R(A_1, A_2, A_3 \ldots\ldots A_n)$ if we assume all the attribute to relation is a candidate key then we get $n$ but this is not the maximum value.

Assume there are 4 attribute (A, B, C, D) and take combination of 2 attribute then maximum key are possible AB, AC, AD, BC, BD, CD which is 6

In general maximum candidate key possible with $n$ attribute is ${}^{n}C_{\left\lfloor \frac{n}{2} \right\rfloor}$

For $n = 12$

${}^{12}C_6 = 924 = X$

Maximum number of superkey possible if all attribute of relation is candidate key.

Maximum superkey possible $= 2^n - 1$

$= 2^8 - 1 = 255 = Y$

$X + Y = 924 + 255$

$= 1179$

QUESTION ANALYTICS

**Q. 31**

Assume there are 50 nodes are connected to a 500 meter length of cable. Each node can transmit 25 frames per second and average length of frame is 2000 bits. ransmission rate at each node is 10 Mbps. The efficiency of this protocol is _____ (in %).

Solution Video | Have any Doubt ?

25 — Correct Option

**Solution :**

25

Node throughput = 25 frame/sec

$= 25 \times 2000$ bits/sec $= 50000$ bit/sec

System throughput = Number of nodes × Node throughput

$= 50 \times 50000$ bit $= 25 \times 10^5$ bit/sec

Maximum system rate = 10 Mbps

So, $\text{efficiency} = \frac{25 \times 10^5 \text{ bit/sec}}{10 \times 10^6 \text{ bit/sec}} = 0.25$

% of efficiency $= 0.25 \times 100 = 25\%$

QUESTION ANALYTICS

**Q. 32**

The order of a node in a B tree index is the maximum number of children it can have, suppose order of a B tree is 7 and it is initially empty. What is the maximum number of time a node can split as a result of 68 successive insertion _____.

Solution Video | Have any Doubt ?

19 — Correct Option

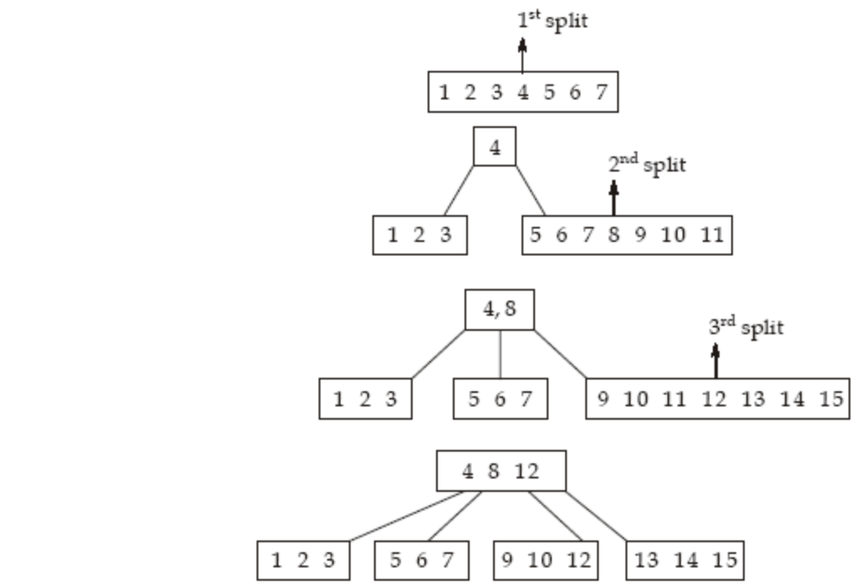
**Solution :**

19

Order of B tree is 7 maximum key a node can contain is $n - 1 = 6$

Maximum number of node split can occure when key are in increasing order.

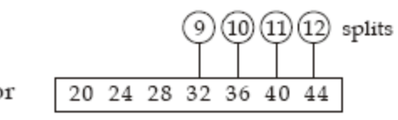
Suppose we insert number from 1, 2, 3 ..... 68




Now on every 4th key insertion we get a node split so




Now for



Leaf node contain value 65 66 67 68 so no more node split.

So total 19 maximum node split.

QUESTION ANALYTICS

**Q. 33**

What is the minimum levels of B tree index is required for 6500 key and order of B tree is 9 _____. (Order of B tree is the maximum child pointers on a B tree node)

Solution Video | Have any Doubt ?

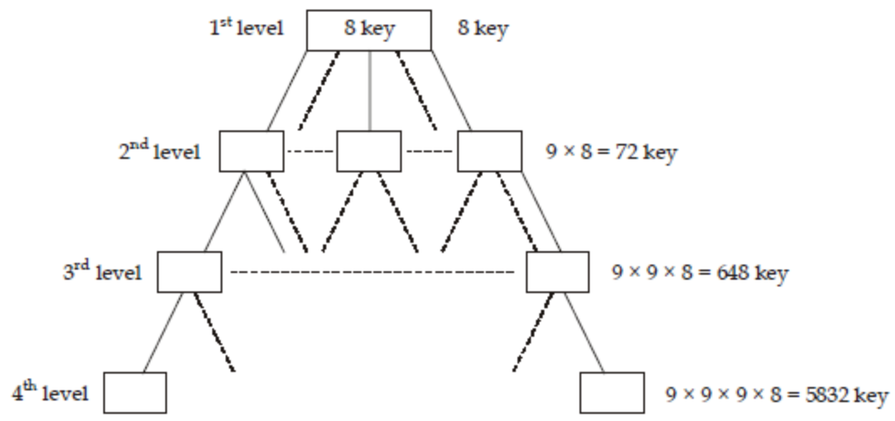
4 — Correct Option

**Solution :**

4

Order = 9

Maximum key possible in one node = 9 – 1 = 8




8 + 72 + 648 + 5832 = 6560

Total 4 level required.

QUESTION ANALYTICS